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ANALYSIS OF DAMPED PLATES

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This report presents three design-oriented methods for the dynamic analysis of sandwich plates, i.e., laminated plates incorporating a core layer of viscoelastic material for vibration damping. The methods are complementary in that each represents a different trade-off between generality, accuracy, and cost of use.

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1.0 INTRODUCTION

The use of viscoelastic materials for vibration control has gained wide acceptance, particularly in the aerospace industry. The advantages of the method are many and well documented. However, the effectiveness of any damping treatment is critically dependent on its geometry and on the properties of the viscoelastic material. An uninformed choice can add cost and weight but fail to solve the vibration problem. Some recent advances in analysis techniques utilize finite element methods to provide a more reliable and systematic approach to the design of damping treatments [1,2,3].

Flat plate sections are structural elements which are often good candidates for integral or add-on damping treatments. Such treatments can be highly effective in solving problems of fatigue, acoustic noise radiation, or other undesirable effects of resonant vibration. One of the most weight-efficient forms of damping for plate applications is a thin layer of a viscoelastic material constrained between two metal face sheets to form a sandwich. The purpose of this report is to describe several methods for the analysis and design of sandwich plate structural elements.

Three methods are presented. Each represents a different trade-off of cost of use, accuracy, and generality.

The first and most general technique is called the Modal Strain Energy (MSE) method. It is implemented in MSC/NASTRAN and is applicable to a wide range of structural forms in addition to plates. Basically, it involves modeling the viscoelastic material in a damped structure with solid elements and the metallic material with solid, plate, shell, or other elements as appropriate. All materials are treated initially as being purely elastic (i.e., incapable of energy dissipation). Normal mode properties are calculated and the strain energy distribution associated with each mode shape is used to calculate an approximate value for the modal loss factor. The theoretical basis of the MSE method is

described later in this report, along with practical considerations for modeling of sandwich plates using MSC/NASTRAN. The basic assumptions of the method are verified by comparisons with an exact closed form solution for the case of a simply supported, unriveted, sandwich rectangular plate.

The second method is essentially a set of design charts for sandwich plates. They allow a designer to obtain the modal frequencies and loss factors of a wide variety of sandwich plates with only simple hand calculations. The charts were compiled from a large number of NASTRAN runs using the modal strain energy method. They are plotted in dimensionless form for generality and give modal properties for the first four modes of a rectangular plate with various boundary conditions. The boundary conditions and the ranges of the dimensionless variables are chosen to be typical of the situations that a designer might commonly encounter in practice.

The third method is a simple, inexpensive technique for designing a treatment to damp the higher order flexural modes of a plate. In this case it may be shown that the boundary conditions are relatively unimportant. A closed form solution is used to give the modal loss factor as a function of natural frequency. The method is implemented in an interactive FORTRAN program and comparisons are made with NASTRAN modal strain energy results to illustrate the effect of the approximations.

2.0 MODAL STRAIN ENERGY METHOD

2.1 OVERVIEW

The discretized equations of motion for a damped structure are usually written in the form

$$\underset{\sim}{M}\ddot{\underset{\sim}{x}} + \underset{\sim}{C}\dot{\underset{\sim}{x}} + \underset{\sim}{K}\underset{\sim}{x} = \underset{\sim}{\ell}(t) \tag{1}$$

where

$\underset{\sim}{M}, \underset{\sim}{C}, \underset{\sim}{K}$ = physical coordinate mass, damping, and stiffness matrices (all real and constant)

$\underset{\sim}{x}, \dot{\underset{\sim}{x}}, \ddot{\underset{\sim}{x}}$ = vectors of nodal displacements, velocities, and accelerations

$\underset{\sim}{\ell}$ = vector of applied node loads

The essence of the modal strain energy method is that it does <u>not</u> attempt to find the damping matrix $\underset{\sim}{C}$. This would be impractical for most real structures and, furthermore, would produce a system of equations which would be very costly to solve. Rather, in the MSE method, one assumes that the damped structure can be represented in terms of the real normal modes of the associated undamped system if appropriate damping terms are inserted into the uncoupled modal equations of motion. That is:

$$\ddot{\alpha}_r + \eta^{(r)}\omega_r\dot{\alpha}_r + \omega_r^2\alpha_r = \ell_r(t) \tag{2}$$

$$\underset{\sim}{x} = \sum_r \underset{\sim}{\phi}^{(r)}\alpha_r(t) \qquad r = 1,2,3 \tag{3}$$

where

α_r = r'th modal coordinate

ω_r = natural radian frequency of the r'th mode

$\underset{\sim}{\phi}^{(r)}$ = r'th mode shape vector of the associated undamped system

$\eta^{(r)}$ = loss factor of the r'th mode

Equations (2) and (3) imply that the physical coordinate damping matrix $\underset{\sim}{C}$ of Eq. (1) need not be explicitly calculated but that it can be diagonalized, at least approximately, by the same real modal matrix that diagonalizes $\underset{\sim}{K}$ and $\underset{\sim}{M}$.

The modal loss factors are calculated by using the undamped mode shapes and the material loss factor for each material. For structures containing a viscoelastic material, the material loss factor of the metal is very small compared to that of the visco-elastic. In this situation the modal loss factor is found from

$$\eta^{(r)} = \eta_v \frac{V_v^{(r)}}{V^{(r)}} \tag{4}$$

where

η_v = material loss factor of viscoelastic evaluated at the r'th calculated resonant frequency

$\dfrac{V_v^{(r)}}{V^{(r)}}$ = fraction of elastic strain energy attributable to the viscoelastic when the structure deforms in the r'th mode shape

A derivation of Eq. (4) is given in Section 2.2 of this report. It is shown that modal loss factors obtained from Eq. (4) will approximate those obtained from the complex stiffness eigenvalues of the complementary solution of Eq. (1). However, the modal strain energy approach has the advantage of much lower cost.

Calculation of the modal energy distributions fits quite naturally within finite element methods and is a standard option in some commercial codes. Further advantages of the method are that only undamped normal modes need be calculated and that the energy distributions obtained are of direct use to the designer in deciding where to locate damping material. The disadvantage is that some approximation is required to accommodate the frequency-dependent properties commonly found in viscoelastic materials.

2.2 THEORY

An approximate expression is derived below for the modal loss factor obtained from an eigenvalue analysis of a structure with complex stiffness.

One form of the discretized (i.e., finite element) version of a partial differential equation for free vibration of a structure is:

$$\underset{\sim}{M}\,\ddot{\underset{\sim}{x}} + \underset{\sim}{K}\,\underset{\sim}{x} = \underset{\sim}{0} \tag{5}$$

where the stiffness matrix $\underset{\sim}{K}$ is constant but complex if the structure contains a viscoelastic material. Equation (5) is converted to an eigenvalue problem by assuming a solution of the form

$$\underset{\sim}{x} = \sum_r \underset{\sim}{\phi}^{*(r)} e^{ip_r^* t} \tag{6}$$

where p_r^* and $\underset{\sim}{\phi}^{*(r)}$ are the r'th complex eigenvalue and eigenvector. That is,

$$\underset{\sim}{\phi}^{*(r)} = \underset{\sim}{\phi}_R^{(r)} + i\underset{\sim}{\phi}_I^{(r)} \tag{7}$$

$$p_r^* = p_r(1+i\eta^{(r)})^{1/2} \tag{8}$$

where $\underset{\sim}{\phi}_R^{(r)}$, $\underset{\sim}{\phi}_I^{(r)}$, $\eta^{(r)}$, and p_r are real. The term $\eta^{(r)}$ is the loss factor for the r'th mode. The eigenvalue problem is then, from Eqs. (5) and (6):

$$\underset{\sim}{K}\,\underset{\sim}{\phi}^* = p^{*2}\,\underset{\sim}{M}\,\underset{\sim}{\phi}^* \tag{9}$$

Now if $\underset{\sim}{K}$ were purely real, $\underset{\sim}{\phi}^{*(r)}$ and p_r^* would be real and related by the usual Rayleigh's quotient formula:

$$p_r^{\,2} = \frac{\underset{\sim}{\phi}^{(r)T}\,\underset{\sim}{K}\,\underset{\sim}{\phi}^{(r)}}{\underset{\sim}{\phi}^{(r)T}\,\underset{\sim}{M}\,\underset{\sim}{\phi}^{(r)}} \tag{10}$$

where the * superscript is dropped to denote a real quantity. If $\underset{\sim}{K}$ is perturbed by $\delta\underset{\sim}{K}$, where $\delta\underset{\sim}{K}$ is complex, $p_r^{\,2}$ will likewise acquire an imaginary part which may be written as $i\eta p^2$ after Eq. (8). Then, if the perturbed stiffness matrix is written as

$$\underset{\sim}{K} = \underset{\sim}{K}_R + i\,\underset{\sim}{K}_I \tag{11}$$

the following is obtained from Eqs. (8), (10), and (11), after dropping the mode index r

$$p^2(1+i\eta) = \frac{\underset{\sim}{\Phi}^{*T}\,\underset{\sim}{K}_R\,\underset{\sim}{\Phi}^*}{\underset{\sim}{\Phi}^{*T}\,\underset{\sim}{M}\,\underset{\sim}{\Phi}^*} + i\,\frac{\underset{\sim}{\Phi}^{*T}\,\underset{\sim}{K}_I\,\underset{\sim}{\Phi}^*}{\underset{\sim}{\Phi}^{*T}\,\underset{\sim}{M}\,\underset{\sim}{\Phi}^*} \tag{12}$$

An approximate value for η can be calculated by approximating the complex eigenvector $\underset{\sim}{\Phi}^*$ by the real vector $\underset{\sim}{\Phi}$, calculated from purely elastic analysis, i.e., by suppressing the imaginary part of $\underset{\sim}{K}$. The approach is essentially an extension of Rayleigh's principle into the complex domain. Making this approximation in Eq. (12) and equating real and imaginary parts gives

$$p^2 = \frac{\underset{\sim}{\Phi}^{T}\,\underset{\sim}{K}_R\,\underset{\sim}{\Phi}}{\underset{\sim}{\Phi}^{T}\,\underset{\sim}{M}\,\underset{\sim}{\Phi}} \tag{13}$$

$$p^2\eta = \frac{\underset{\sim}{\Phi}^{T}\,\underset{\sim}{K}_I\,\underset{\sim}{\Phi}}{\underset{\sim}{\Phi}^{T}\,\underset{\sim}{M}\,\underset{\sim}{\Phi}} \tag{14}$$

If the matrix $\underset{\sim}{K}$ is obtained by finite element analysis, it may be divided into two additive terms. The first, called $\underset{\sim}{K}_e$, is obtained from contributions of the purely elastic elements (the metallic portion of the structure). The second, called $\underset{\sim}{K}_v$, is obtained from the solid elements (used to model the viscoelastic material). Both terms are matrices of the same order as $\underset{\sim}{K}$,

$$\underset{\sim}{K} = \underset{\sim}{K}_e + \underset{\sim}{K}_v \tag{15}$$

$\underset{\sim}{K}_e$ will be completely real. $\underset{\sim}{K}_v$ will be complex but, for the present case where only a single viscoelastic material is involved, its imaginary and real parts will have the ratio η_v:1 where η_v is the material loss factor of the core. Then,

$$\underset{\sim}{K}_v = \underset{\sim}{K}_{vR} + i\, \underset{\sim}{K}_{vI} \tag{16}$$

$$= \underset{\sim}{K}_{vR}\ (1+i\eta_v) \tag{17}$$

By previous assumption, only $\underset{\sim}{K}_v$ contributes to $\underset{\sim}{K}_I$ so

$$\underset{\sim}{K}_I = \underset{\sim}{K}_{vI} \tag{18}$$

When a purely elastic normal modes analysis is performed, the strain energy associated with a given mode shape is

$$V = \underset{\sim}{\phi}^T \underset{\sim}{K}_R\, \underset{\sim}{\phi} \tag{19}$$

The portion of this energy which is attributable to strain in the core is

$$V_v = \underset{\sim}{\phi}^T\, \underset{\sim}{K}_{vR}\, \underset{\sim}{\phi} \tag{20}$$

Eliminating p^2 between Eq. (12) and (13) gives

$$\eta = \eta_v \frac{\underset{\sim}{\phi}^T\, \underset{\sim}{K}_I\, \underset{\sim}{\phi}}{\underset{\sim}{\phi}^T\, \underset{\sim}{K}_R\, \underset{\sim}{\phi}} \tag{21}$$

Combining Eq. (17) through (21) and reinstating the mode index superscript gives the final result for modal loss factor in terms of elastic energies

$$\eta^{(r)} = \eta_v \frac{V_v^{(r)}}{V^{(r)}} \tag{22}$$

This derivation is intended to motivate and clarify the comparison of results from complex eigenvalue analysis and modal strain energy analysis. It should be noted, however, that the problem statement itself is not entirely realistic. It is well known that complex stiffnesses that do not vary with frequency lead to system responses that are noncausal (response anticipates input) and hence are not physically realizable. Nonetheless, the comparison is believed to be useful in that the symptoms of noncausality are quite weak [4] and the identical assumptions are applied in both methods.

2.3 FINITE ELEMENT MODELING OF THREE-LAYER PLATES

2.3.1 Choice of Elements

Modeling of sandwich structures requires that the strain energy due to shearing of the core be accurately represented. Practical considerations dictate that this be done with minimum increase in computation cost relative to a uniform, single-layer model. In this section, a modeling method is described which is reasonably efficient and has the important advantage of being readily implemented within MSC/NASTRAN, a widely available code.

Figure 1 shows the arrangement for modeling of a three-layer sandwich. The face sheets are modeled with quadrilateral or triangular plate elements producing stiffness at two rotational and three translational degrees of freedom per node. The visco-elastic core is modeled with solid elements producing stiffness at three translational degrees of freedom per node. All nodes are at element corners. In MSC/NASTRAN, the plate elements are called TRIA3's, QUAD4's, TRIA6's, and QUAD8's, and the solid elements are called PENTA's and HEXA's. A key feature of these plate elements in the present application is their ability to account for coupling between stretching and bending deformations [5]. This allows the plate nodes to be offset to one surface of the plate, coincident with the corner nodes of the adjoining solid elements. In this way a three-layer plate can be modeled

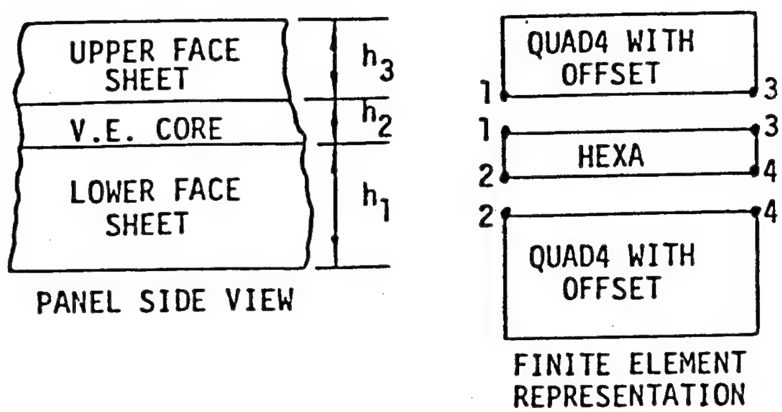

Figure 1 Finite element modeling of a sandwich panel with viscoelastic core

with only two layers of nodes. Earlier methods implemented within NASTRAN were restricted to beams [6] or required four layers of nodes and extensive constraint equations to achieve the proper bending-shearing behavior of the sandwich [7]. Aspect ratios of the solid elements (in-plane dimension/thickness dimension) as high as 5000 have been used successfully to model the thin viscoelastic core layers. In all analyses reported here, Poisson's ratio of the core elements is taken to be 0.49.

2.3.2 Reduction of Equations of Motion

In all but the smallest problems, the mass and stiffness matrices are condensed by partitioning and performing a Guyan reduction prior to calculation of eigenvalues. As usual in vibration analysis, some care is warranted in the selection of the degrees of freedom to be retained during this reduction. For the sandwich structures analyzed in this report, only out-of-plane displacements need be retained. Some displacements should be retained for both face sheets, although it is not necessary to keep both upper and lower face displacements at any single location on the model. If out-of-plane displacements of only one face sheet are kept, the results for natural frequencies as well as core-to-total energy ratios can show a pronounced dependence on the Poisson's ratio of the core. Although such a dependence is probably real for some cases, such as doubly curved shells, it should not occur for simpler cases such as straight sandwich beams--and in fact does not occur if the rule given above is observed in reducing the discretized equations of motion. Existing data on Poisson's ratio of most viscoelastic materials are probably not adequate for accurate modeling of doubly curved sandwich shells in the important transition region of the material, and certainly not in the glassy region.

2.3.3 Solution Method

In the modal strain energy method, a standard normal mode extraction run is made with all material constants treated as real and constant. The elastic strain energy in each element for each mode is calculated, as well as the energy fraction in the viscoelastic core for each mode. These fractions multiplied by the core material loss factor give the modal loss factors which are input via a damping vs. frequency table for use in subsequent forced response calculations.

A basic difficulty with the modal strain energy method (or any normal mode method) is that the modal properties are obtained from system matrices that are assumed to be constant. Viscoelastic materials, however, have storage moduli which vary significantly with frequency. There is no theoretically correct way to resolve this contradiction. However, there are great practical advantages to making response predictions in terms of a normal mode set obtained from constant material properties. This can be done with reasonable accuracy if a simple correction is made to the modal loss factors obtained by Equation (4). This correction is only to the modal damping ratios because these are the only modal parameters that can be readily adjusted by the finite element analyst. It is explained here for completeness even though no forced response calculations were performed for this report. The correction is obtained as follows.

For broadband excitation, most of the response of a given mode occurs within a narrow band around the mode's natural frequency. It is natural then to require that the energy distribution used to compute the loss factor for a given mode be obtained using a stiffness matrix evaluated for material properties taken at that mode's frequency. Because the natural frequencies themselves depend on material properties, an iterative solution of two simultaneous relations (the eigenvalue problem for each mode number and the material property vs. frequency relation) is required. This is readily done [1], but a further problem remains. The final modal coordinate representation of the structure must

come from a single stiffness matrix evaluated using a single value of storage modulus for the core material. Natural frequencies, mode shapes, and modal masses will be correct for, at most, one mode. A further correction of the modal loss factor has been found to give some improvement.

Each modal equation of motion has the form given in Equation (2). At resonance the first and last terms on the left cancel each other. The response magnitude is inversely proportional to the product $\eta^{(r)}\omega_r$ which is the coefficient of $\dot{\alpha}_r$, the modal velocity. If $\eta^{(r)}$ is altered to correct for the error in ω_r, an improvement in peak response can be expected, although resonance will still occur at a slightly shifted frequency and some error will remain due to ℓ_r which depends on modal mass. In test cases run for sandwich beams [1], it was found that taking ω_r to be proportional to $\sqrt{G_2}$ (G_2 = core shear modulus) would improve the agreement between the MSE method and the direct frequency response method. This is of course an approximation since ω_r depends on properties of the face sheets as well as the core. The modal damping ratios are adjusted according to

$$\eta^{(r)'} = \eta^{(r)} \sqrt{\frac{G_2(f_r)}{G_{2,ref}}} \tag{23}$$

where

$\eta^{(r)'}$ = adjusted modal damping ratio for the r'th mode

$\eta^{(r)}$ = modal damping ratio for the r'th mode obtained by iteration

$G_{2,ref}$ = core shear modulus used in final normal modes calculation to obtain modal frequencies, shapes, and masses

$G_2(f_r)$ = core shear modulus at $f = f_r$ where f_r is r'th mode frequency calculated with $G_2 = G_{2,ref}$

2.4 EXAMPLE

A closed form solution exists for the complex eigenvalues (i.e., natural frequencies and modal loss factors) of a simply supported sandwich plate [8]. The solution is described in Section 4.0 of this report in connection with the design of constrained-layer damping treatments for high-order local modes of plate sections. In this section it is used to verify one of the most important implications of the MSE method; namely, that the modal loss factors for all modes of a sandwich plate are directly proportional to the material loss factor of the viscoelastic core. The sample problem is also used to illustrate the input data to NASTRAN for MSE analysis of a sandwich plate.

Figures 2 through 5 give a comparison of modal loss factors obtained by using MSC/NASTRAN and MSE (MSC/NASTRAN-MSE) and by the closed form solution of Ref. [8]. The format of these plots is used throughout this report and is explained in detail in Section 3.1. In brief, the ordinate is a dimensionless quantity proportional to modal loss factor and the abscissa is a dimensionless quantity proportional to the shear modulus of the viscoelastic core. The curves marked with specific values of η_v are obtained from the closed form solution. The remaining curve, obtained by the MSC/NASTRAN-MSE method, gives results that are inherently independent of η_v.

The test case is a simply supported rectangular sandwich plate of the following dimensions:

in-plane dimensions	=	10" x 11"
upper face sheet thickness	=	0.055"
lower face sheet thickness	=	0.055"
core thickness	=	0.0045"
face sheet material	=	aluminum
		$E = 10^7$ psi
		$\rho = 0.1$ lb/in^3
		$\nu = 0.3$
shear modulus of core material	=	variable
loss factor of the core material	=	variable

Figures 2 through 5 show that the closed form and MSC/NASTRAN-MSE results agree very closely for small values of the material loss factor. Some divergence is seen for larger values on the order of unity or greater. The agreement also depends on the value of the shear parameter g. It is best for g equal to or less than the value giving highest damping. Fortunately, most practical constrained layer treatments tend to fall in this range.

A tabular representation of the closed form results used to prepare Figures 2 through 5 is given in Tables 1 through 4. Results for higher modes are also given in the tables.

Sample NASTRAN input and output are given in Appendix A for a plate with the properties listed above and a core shear modulus of 450 psi. This sample case corresponds to a dimensionless shear parameter of g = 40.

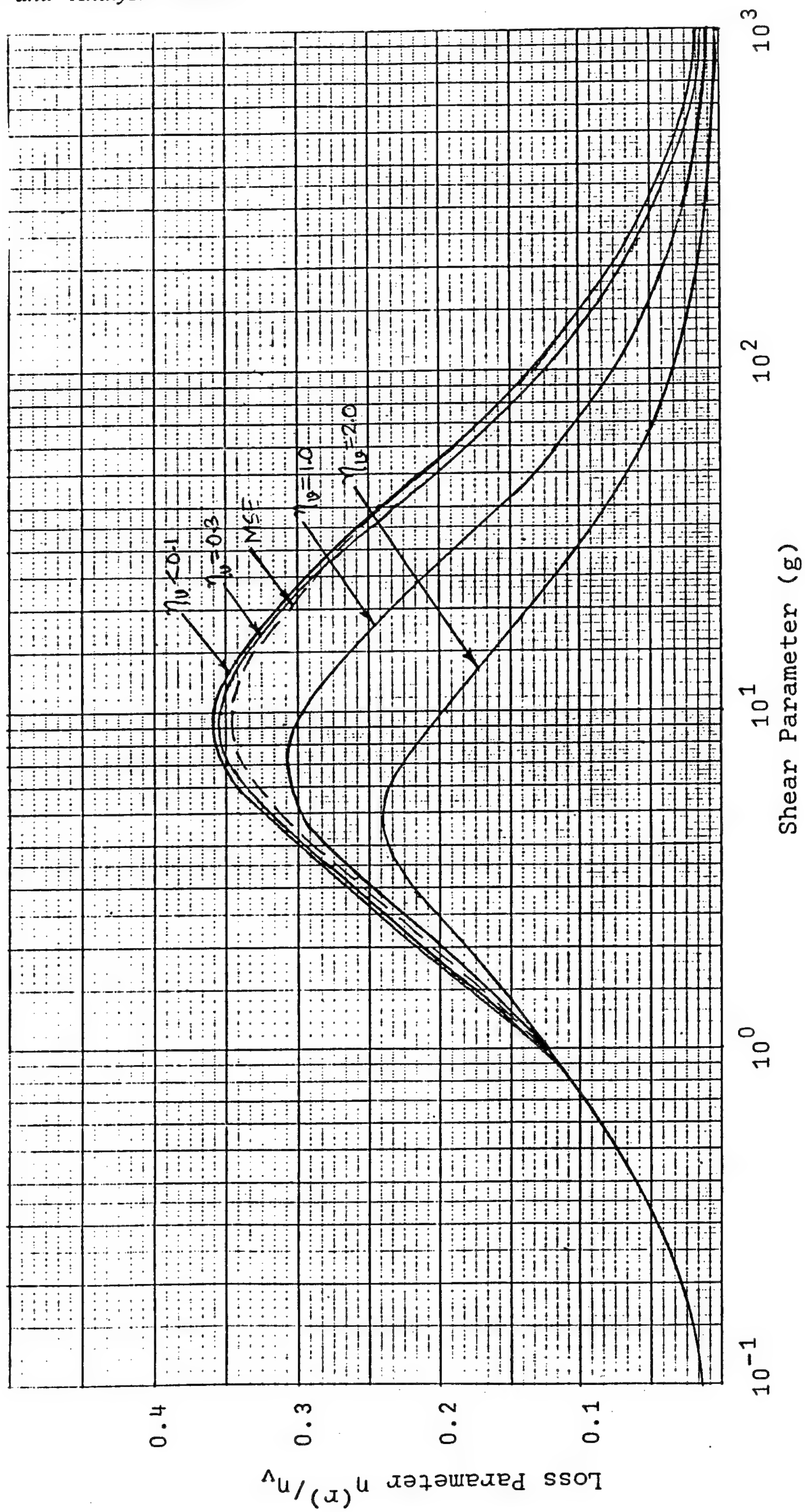

Figure 2 Damping of the first mode of simply supported rectangular sandwich plate obtained by NASTRAN/Modal Strain Energy method and by exact complex eigenvalue solution [8]

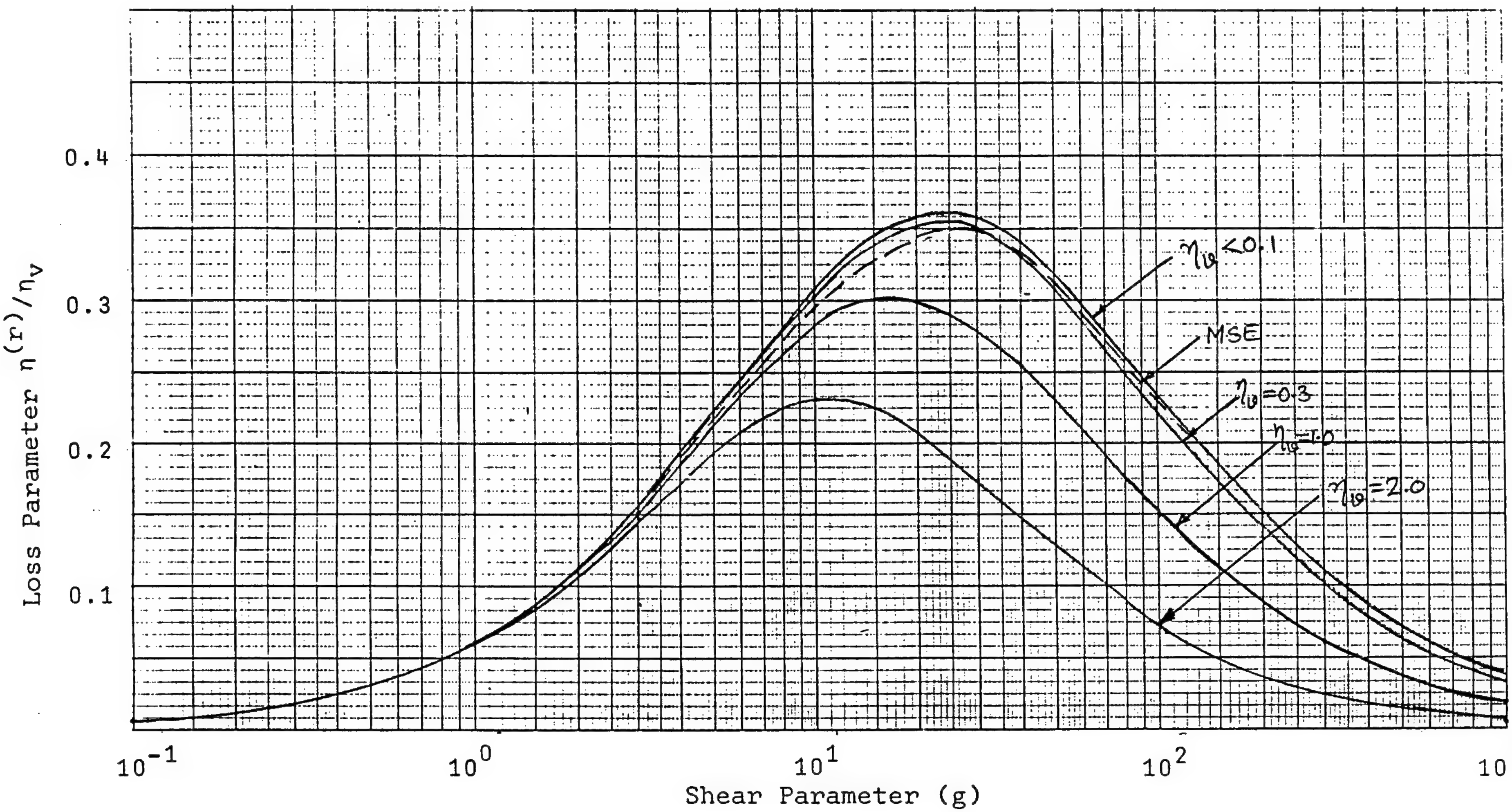

Figure 3 Damping of the second mode of simply supported rectangular sandwich plate obtained by NASTRAN/Modal Strain Energy method and by exact complex eigenvalue solution [8]

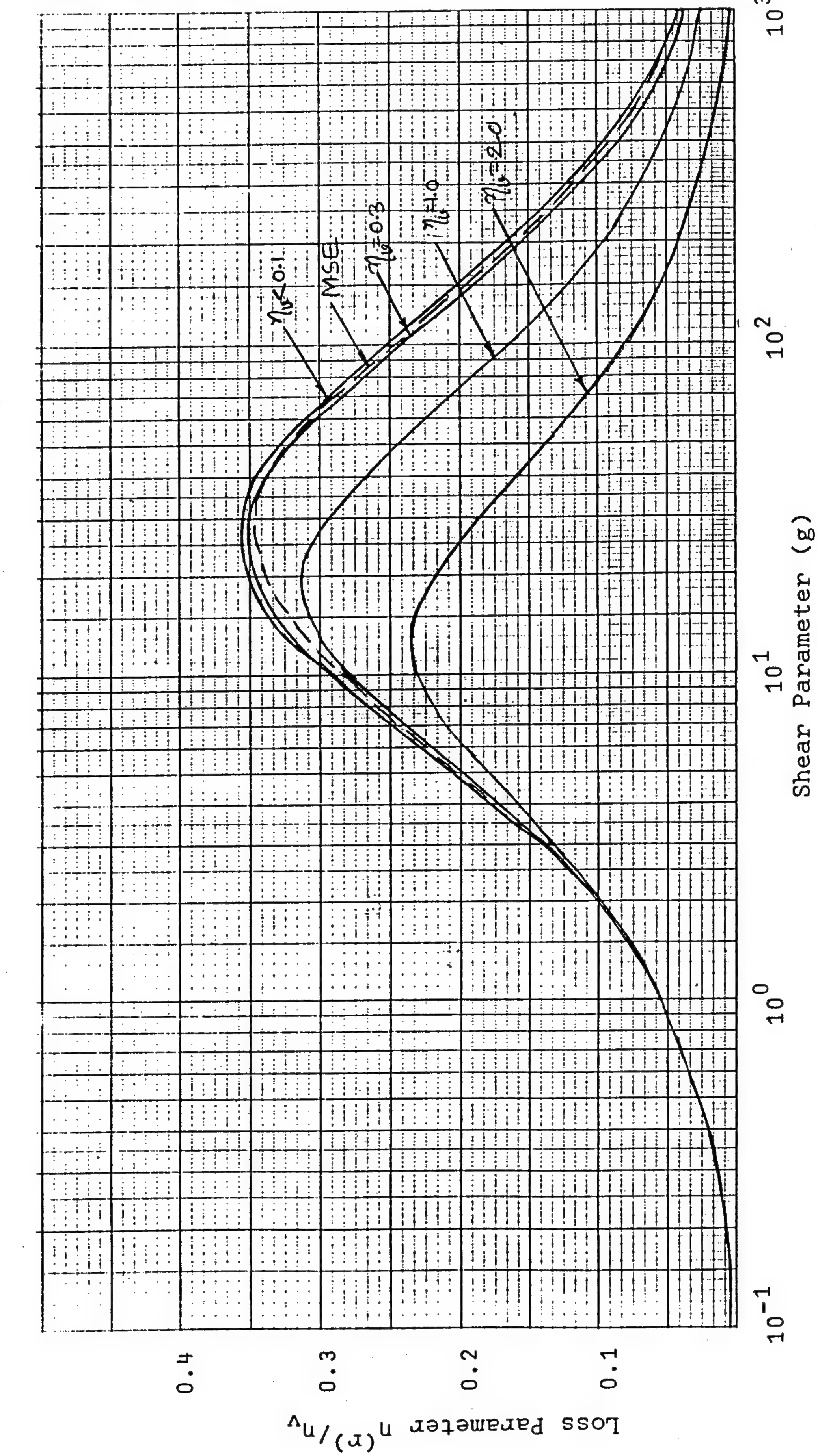

Figure 4 Damping of the third mode of simply supported rectangular sandwich plate obtained by NASTRAN/Modal Strain Energy method and by exact complex eigenvalue solution [8]

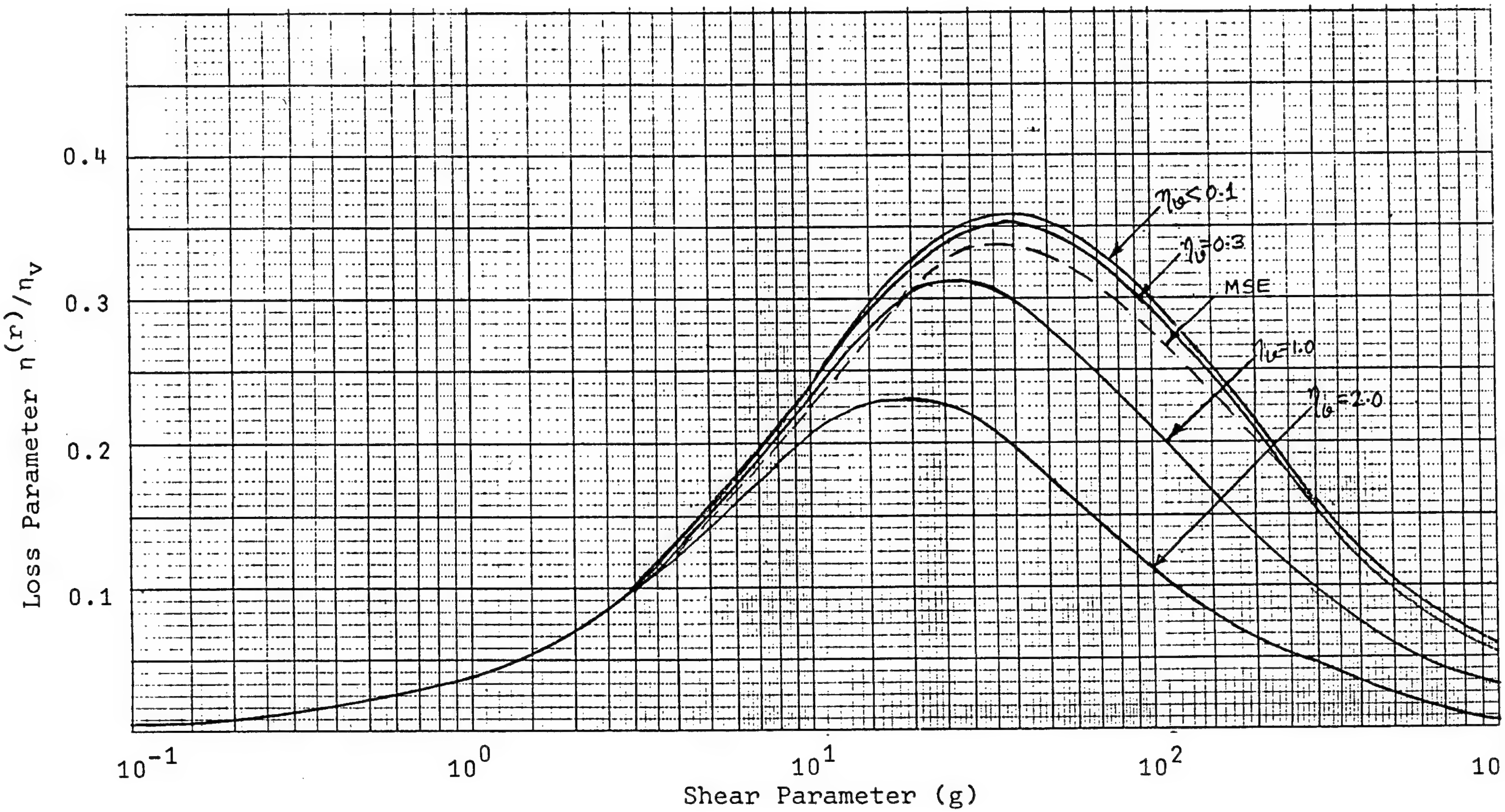

Figure 5 Damping of the fourth mode of simply supported rectangular sandwich plate obtained by NASTRAN/Modal Strain Energy method and by exact complex eigenvalue solution [8]

TABLE 1

MODAL FREQUENCIES AND MODAL LOSS FACTORS
FOR A RECTANGULAR SANDWICH PLATE

Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5
Viscoelastic Loss Factor (η_V) = 0.1

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)
1	530.	0.0016	565.	0.0128	698.	0.0338	163.	0.0281	190.	0.0074	196.	0.0016
2	1244.	0.0007	1280.	0.0062	1450.	0.0241	333.	0.0355	428.	0.0149	458.	0.0037
3	1394.	0.0006	1430.	0.0056	1604.	0.0226	366.	0.0358	476.	0.0162	512.	0.0041
4	2107.	0.0004	2145.	0.0038	2329.	0.0173	514.	0.0352	493.	0.0214	767.	0.0061
5	2433.	0.0004	2471.	0.0033	2658.	0.0156	579.	0.0343	787.	0.0233	882.	0.0069
6	2833.	0.0003	2870.	0.0029	3061.	0.0139	657.	0.0332	900.	0.0253	1021.	0.0079
7	3297.	0.0003	3334.	0.0025	3528.	0.0124	746.	0.0317	1026.	0.0273	1181.	0.0090
8	3547.	0.0002	3584.	0.0023	3779.	0.0116	793.	0.0310	1092.	0.0282	1266.	0.0096
9	4099.	0.0002	4136.	0.0020	4333.	0.0104	897.	0.0293	1237.	0.0299	1453.	0.0108
10	4736.	0.0002	4774.	0.0017	4973.	0.0092	1016.	0.0275	1398.	0.0315	1665.	0.0121

TABLE 2

MODAL FREQUENCIES AND MODAL LOSS FACTORS
FOR A RECTANGULAR SANDWICH PLATE

Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5
Viscoelastic Loss Factor (η_v) = 0.3

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	530.	0.005	565.	0.038	700.	0.101	172.	0.188	191.	0.021	196.	0.005
2	1244.	0.002	1280.	0.018	1451.	0.072	352.	0.281	430.	0.042	458.	0.010
3	1394.	0.002	1430.	0.017	1605.	0.067	385.	0.289	478.	0.046	513.	0.012
4	2107.	0.001	2145.	0.011	2330.	0.052	535.	0.305	696.	0.061	769.	0.017
5	2433.	0.001	2471.	0.010	2659.	0.047	600.	0.304	792.	0.067	884.	0.019
6	2833.	0.001	2870.	0.086	3062.	0.042	678.	0.299	905.	0.073	1024.	0.022
7	3297.	0.001	3335.	0.074	3529.	0.037	766.	0.292	1033.	0.079	1184.	0.025
8	3547.	0.001	3584.	0.069	3780.	0.035	813.	0.287	1100.	0.081	1270.	0.027
9	4099.	0.001	4136.	0.006	4334.	0.031	916.	0.275	1245.	0.087	1458.	0.030
10	4736.	0.001	4774.	0.005	4973.	0.027	1034.	0.262	1406.	0.092	1671.	0.034

TABLE 3

MODAL FREQUENCIES AND MODAL LOSS FACTORS
FOR A RECTANGULAR SANDWICH PLATE

Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5
Viscoelastic Loss Factor (η_V) = 1.0

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	530.	0.016	566.	0.127	721.	0.302	172.	0.188	194.	0.040	197.	0.008
2	1244.	0.007	1281.	0.062	1467.	0.232	352.	0.281	443.	0.086	462.	0.019
3	1394.	0.006	1431.	0.056	1620.	0.219	385.	0.289	494.	0.095	517.	0.022
4	2107.	0.004	2145.	0.038	2342.	0.170	535.	0.305	726.	0132.	778.	0.032
5	2433.	0.003	2471.	0.033	2670.	0.154	600.	0.304	828.	0.147	897.	0.037
6	2833.	0.003	2871.	0.029	3072.	0.138	678.	0.299	949.	0.163	1041.	0.043
7	3297.	0.003	3335.	0.025	3537.	0.123	766.	0.292	1085.	0.181	1207.	0.049
8	3547.	0.002	3585.	0.023	3788.	0.116	813.	0.287	1157.	0.189	1295.	0.052
9	4099.	0.002	4137.	0.020	4341.	0.103	916.	0.275	1311.	0.207	1490.	0.060
10	4736.	0.002	4774.	0.017	4980.	0.091	1035.	0.2615	1483.	0.224	1713.	0.068

TABLE 4

MODAL FREQUENCIES AND MODAL LOSS FACTORS
FOR A RECTANGULAR SANDWICH PLATE

Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5
Viscoelastic Loss Factor (η_V) = 2.0

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	530.	0.031	571.	0.248	778.	0.458	184.	0.188	196.	0.033	198.	0.003
2	1244.	0.014	1283.	0.123	1518.	0.421	385.	0.344	456.	0.075	465.	0.008
3	1394.	0.012	1433.	0.111	1668.	0.403	422.	0.366	510.	0.083	521.	0.009
4	2107.	0.008	2146.	0.076	2379.	0.326	583.	0.434	759.	0.122	786.	0.013
5	2433.	0.007	2472.	0.066	2704.	0.297	650.	0.451	870.	0.138	907.	0.0152
6	2833.	0.006	2872.	0.057	3102.	0.268	729.	0.462	1004.	0.158	1055.	0.018
7	3297.	0.005	3336.	0.049	3564.	0.240	818.	0.468	1156.	0.179	1225.	0.021
8	3547.	0.005	3585.	0.046	3813.	0.228	865.	0.468	1236.	0.190	1317.	0.044
9	4099.	0.004	4136.	0.040	4364.	0.203	967.	0.463	1409.	0.213	1519.	0.051
10	4736.	0.004	4775.	0.035	5000.	0.181	1083.	0.453	1603.	0.238	1751.	0.058

3.0 DESIGN CHARTS FOR SANDWICH PLATES

In this section, sets of design charts are given which allow a user to rapidly estimate the loss factors and natural frequencies for a rectangular sandwich plate of various boundary conditions. The charts were compiled from a large number of NASTRAN analyses using the modal strain energy method. They allow fairly accurate predictions of damping which take boundary conditions into account and yet do not require the user to actually prepare or run any finite element models. The usefulness of these charts derives from the fact that, to the authors' knowledge, no exact solutions exist for other than simply supported boundary conditions.

3.1 DATA FORMAT

The charts are in terms of dimensionless variables in order to convey the maximum amount of information. It may be shown [9] that a rectangular sandwich plate can be completely described by four dimensionless parameters:

η_v = core material loss factor

g = shear parameter

$$= \frac{\overline{G}}{T_2} \left(\frac{1}{E_1 T_1} + \frac{1}{E_3 T_3}\right) a^2 \, (1-\nu^2) \qquad (24)$$

Y = geometry parameter

$$= \frac{(T_1+T_3+2T_2)^2}{4D(1-\nu^2)} \left[\frac{E_1 T_1 E_3 T_3}{E_1 T_1 + E_3 T_3}\right] \qquad (25)$$

Δxy = in-plane aspect ratio (26)

= b/a

where

T_1, T_3 = thicknesses of the face sheets

T_2 = thickness of the core layer

$\overline{G}$ = real part of the complex shear modulus $[\overline{G}(1+i\eta_v)]$ of the viscoelastic material

E_1, E_3 = Young's moduli of the face sheets

a,b = in-plane dimensions of the plate

D = sum of the flexural stiffnesses of the upper and lower face sheets, each about its own center plane

ν = Poisson's ratio of the face sheets

The charts give the dimensionless loss parameter, $\eta^{(r)}/\eta_v$, as a function of the shear parameter for the first four bending modes of a plate for various values of the aspect ratio and geometry parameter. A value of approximately Y = 3.5 characterizes a sandwich plate with equal thickness face sheets. The situation of equal face sheets is fairly common in practice and therefore is included for all boundary conditions. Additional values of Y are included for some boundary conditions to cover the case of unequal face sheets which often occurs with add-on constrained layer damping treatments.

Natural frequencies, in a normalized form, are also given as a function of shear parameter for the first four modes. The form is f_r/f_{01} where f_r is the natural frequency of the r'th mode. The reference frequency f_{01} is defined as the first natural frequency of a simply supported plate of the same in-plane dimensions as the actual plate but with flexural stiffness equal to the sum of the stiffnesses of the upper and lower face sheets. They are calculated using the formula [9]:

$$f_{01} = \frac{1}{2\pi}\sqrt{\frac{D}{\rho}\left[\left(\frac{m\pi}{a}\right)^2 + \left(\frac{n\pi}{b}\right)^2\right]^2} \quad ; \qquad m=1 \qquad n=1 \tag{27}$$

where

ρ = mass density per unit area of the plate

The reference frequencies calculated by Eq. (27) are given in Table 5. It may be noted that they are not strictly functions of only the shear and geometry parameters but also depend on the material properties of the face sheets. Since two different sets of properties (corresponding to steel and aluminum) were used to span the desired range of the shear parameter, the reference frequencies corresponding to each are given.

Summary tables of the NASTRAN results used to prepare the frequency and damping plots are given for each set of boundary conditions. The tables give results for the fifth and higher modes, in addition to the first four modes for which results are plotted.

Each graph and table is marked with a three letter abbreviation denoting the boundary conditions. The first character in every case is a P (pinned) and indicates that out-of-plane displacements of both face sheets were constrained. The second character is either a T (tilting), L (level), or W (wind-up). Respectively, they designate an unconstrained, perfectly constrained, or elastically constrained condition on rotation of the face sheets about an axis parallel to the plate edge. The third character is either a U (unriveted) or an R (riveted). Riveted implies that shearing deformation of the core has been constrained along the plate edge.

TABLE 5
REFERENCE FREQUENCIES

ASPECT RATIO	GEOMETRIC PARAMETER (Y)							
	0.5		1.5		3.5		4.5	
	Aluminum Face Sheets	Steel Face Sheets	Aluminum Face Sheets	Steel Face Sheets	Aluminum Face Sheets	Steel Face Sheets	Aluminum Face Sheets	Steel Face Sheets
Δxy = 1.1 a = 10.0 b = 11.0	81.	838.	76.	468.	94.	527.	78./57.*	351.
Δxy = 2.0 a = 5.5 b = 11.0	183.	1894.	171.	1058.	212.	1193.	177./129.*	794.
Δxy = 4.0 b = 2.75 a = 11.0	622.	6437.	582.	3599.	722.	4055.	601./438.*	2700.

* for shear parameter = 1000.

3.2 DESIGN CHARTS

3.2.1 PTU Boundary Conditions

The results for PTU (simply-supported, unriveted) boundary conditions are given in Figures 6 through 14 and Tables 6 through 17. These boundary conditions are likely to be appropriate for plate sections in lightweight, built-up structures using add-on constrained layer damping. Several values of the geometry parameter are used since it is likely to be a design variable in these situations.

Figure 6 shows damping as a function of shear parameter for the first four modes, with a geometry parameter of Y = 3.5 and an aspect ratio Δxy = 1.1. Figures 7 and 8 show similar information for aspect ratios of 2.0 and 4.0. The next six figures, 9 through 14, give similar data but organized to show how damping varies with the geometric parameter as well as the shear parameter. For clarity, the data covering four modes (for each value of aspect ratio) is split into two plots, with each plot covering two alternate modes.

Natural frequencies of sandwich plates with PTU boundary conditions can be obtained from Figures 15 through 26. Each plot gives results for one of three aspect ratios (1.1, 2.0, or 4.0) and one of four geometry parameters (0.5, 1.5, 3.5, or 4.5). Reference frequencies used in normalizing the data of these figures are given in Table 5.

A tabular representation of the data in Figures 6 through 26 as well as data for higher modes is given in Tables 6 through 17.

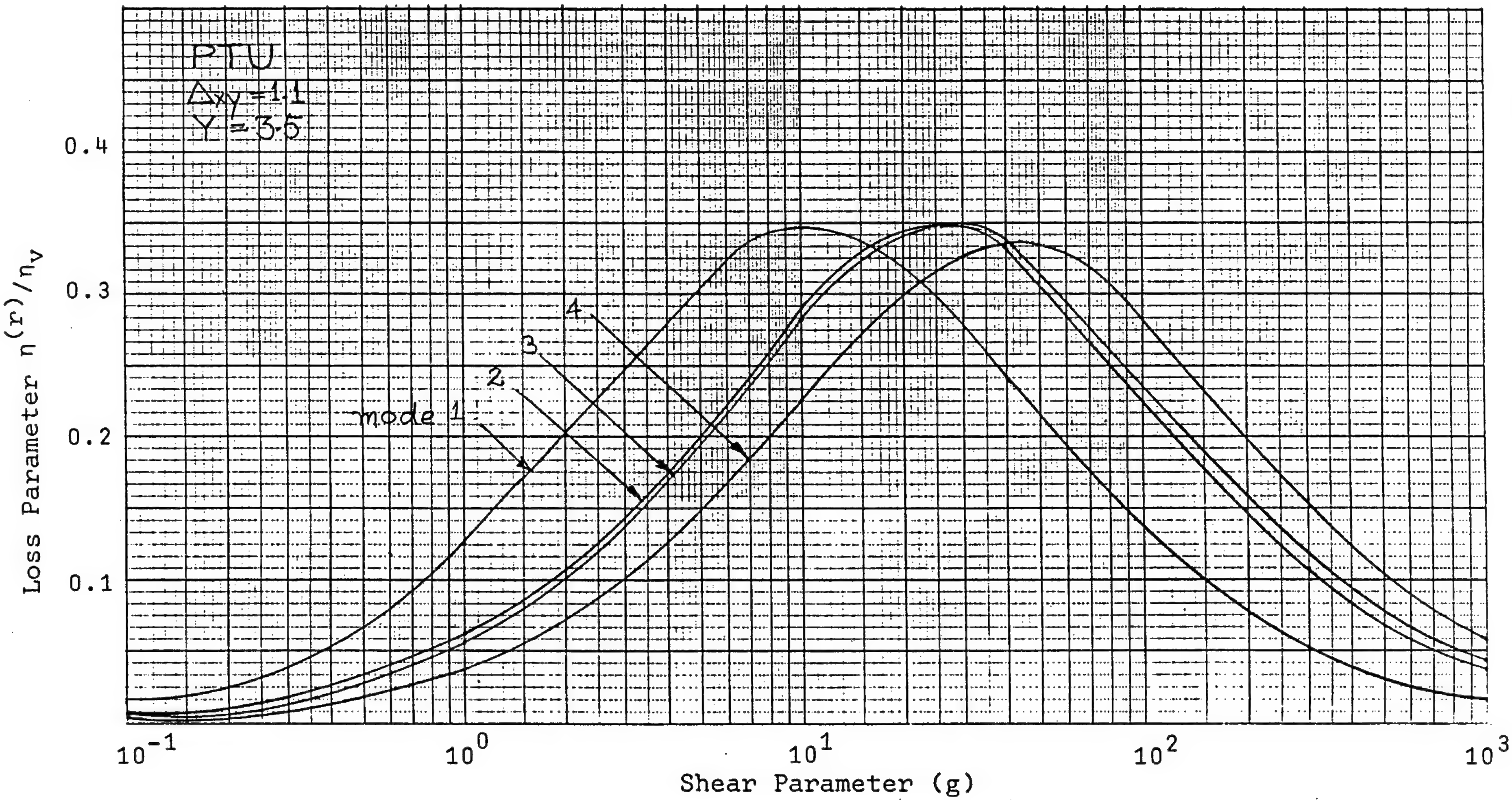

Figure 6 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

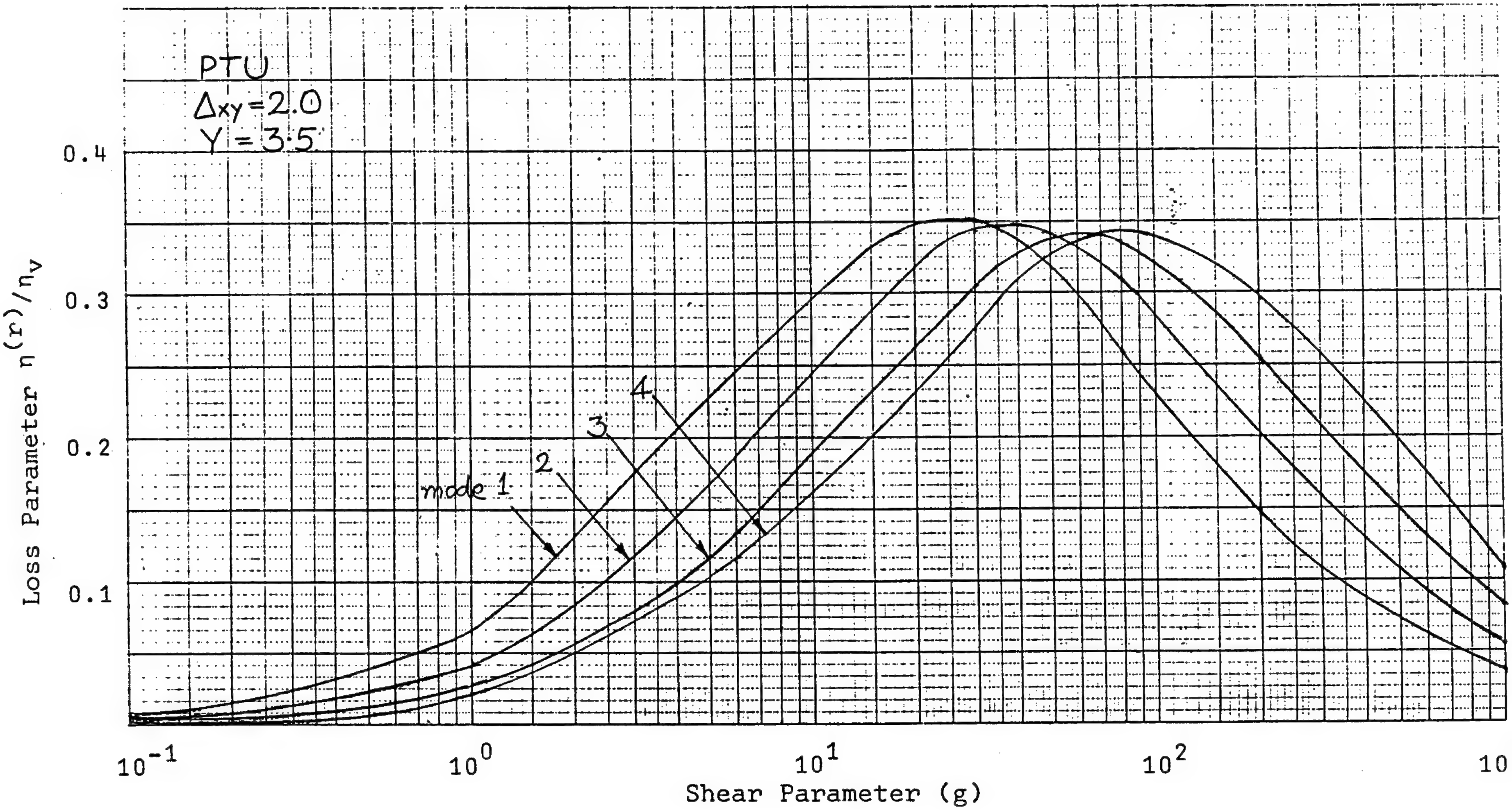

Figure 7 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

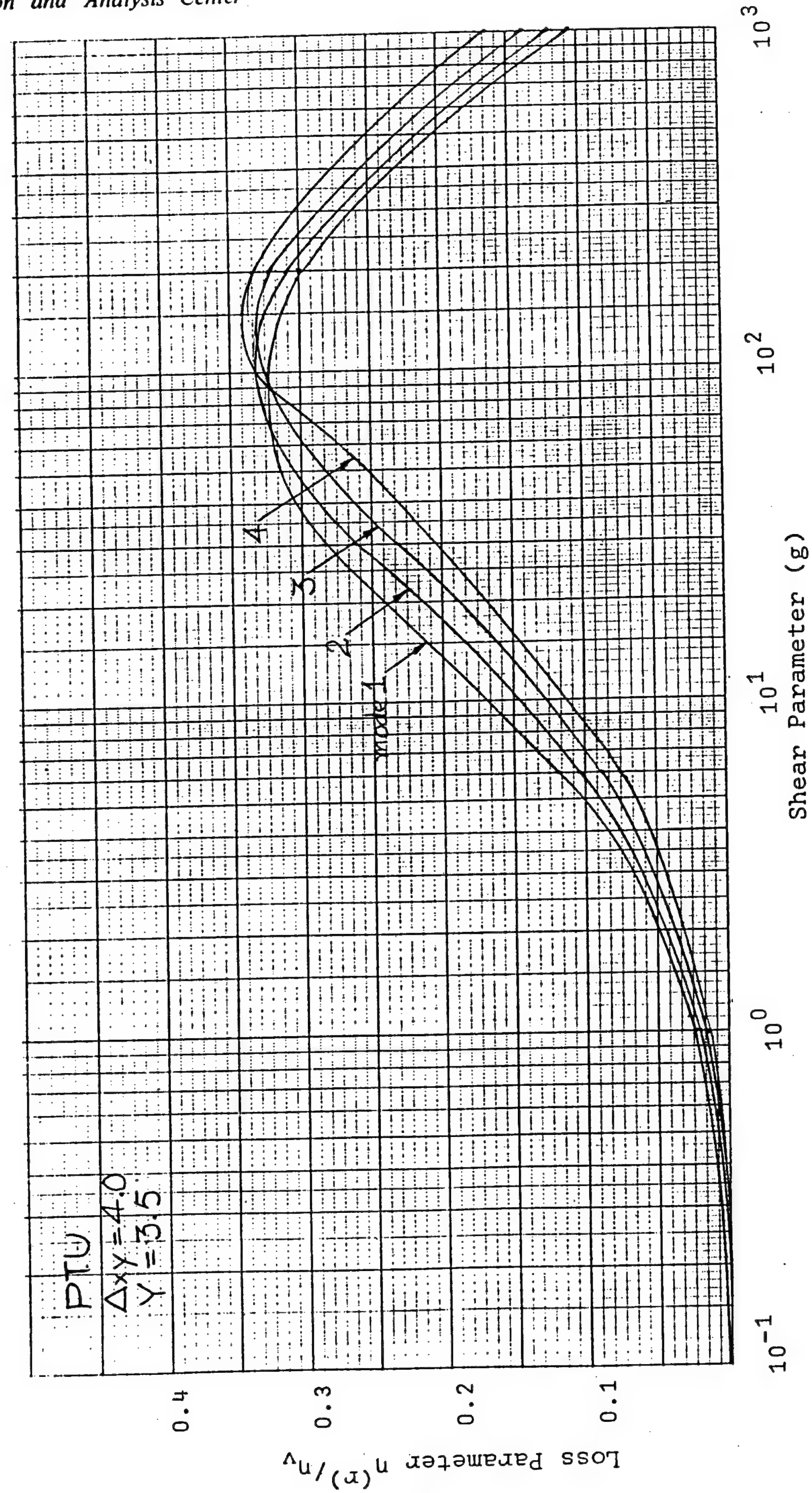

Figure 8 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

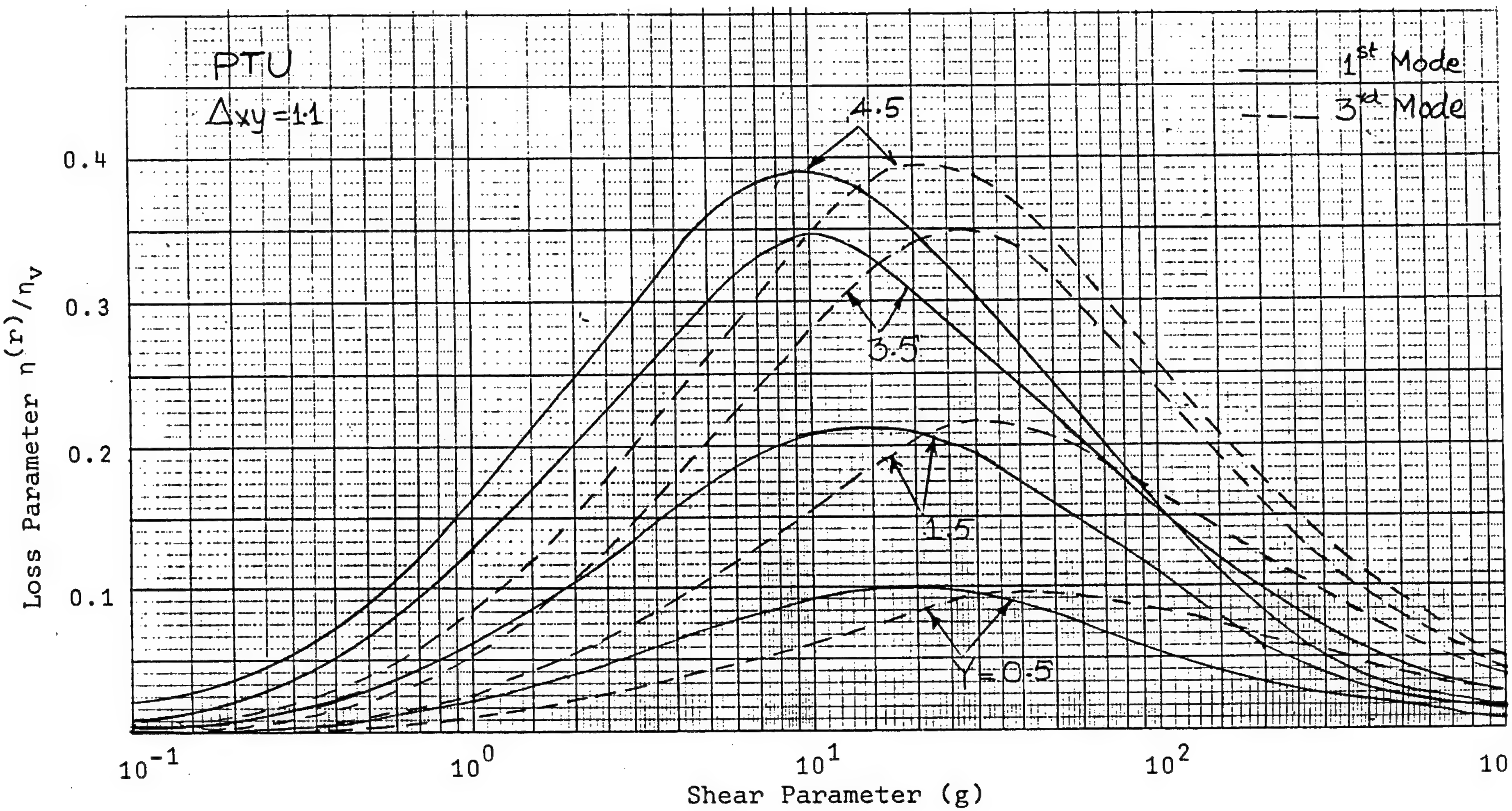

Figure 9 Damping of a sandwich rectangular plate, PTU boundary conditions, Δxy = 1.1, modes 1 and 3, variable Y and g

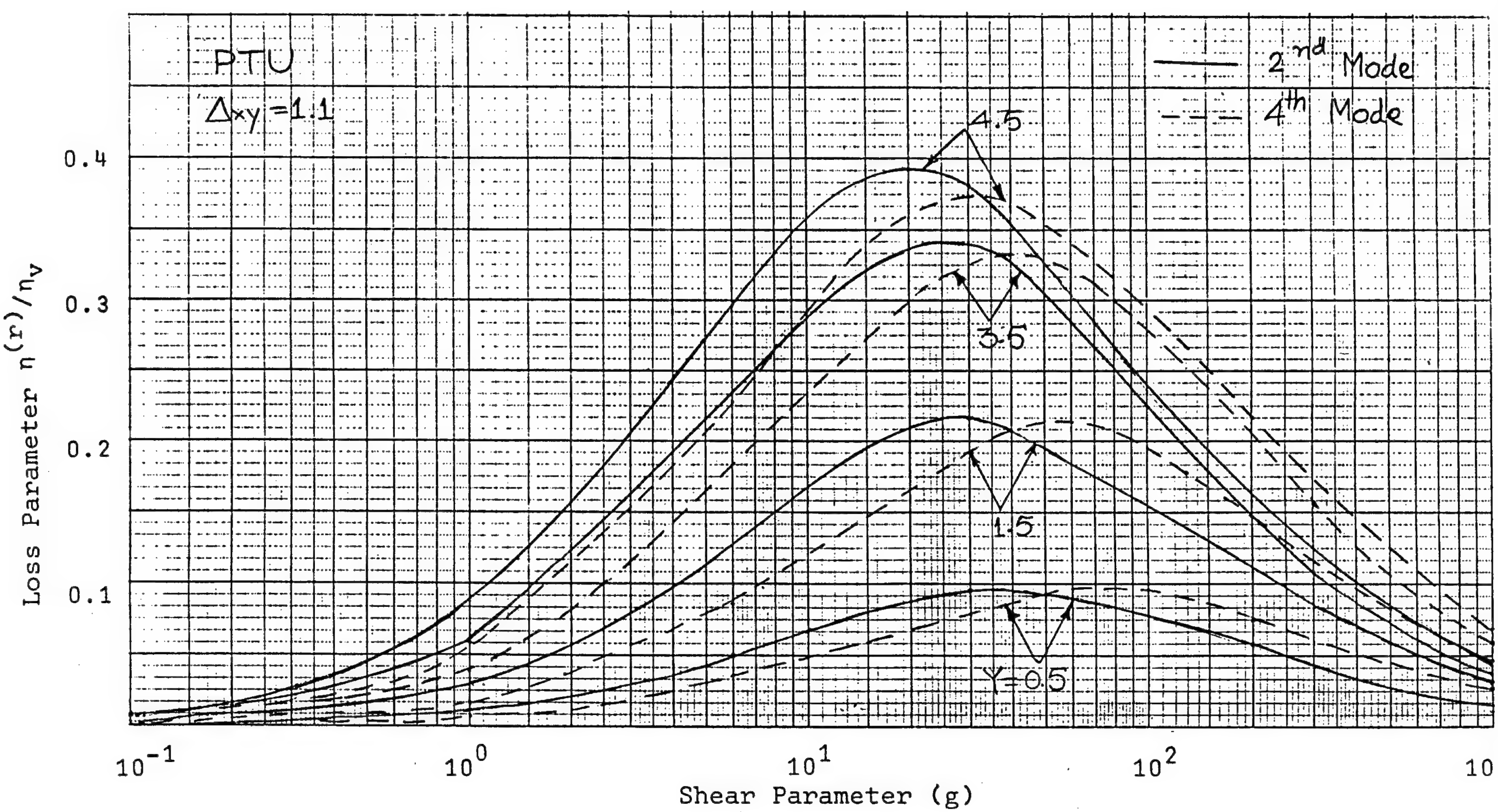

Figure 10 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 1.1$, modes 2 and 4, variable Y and g

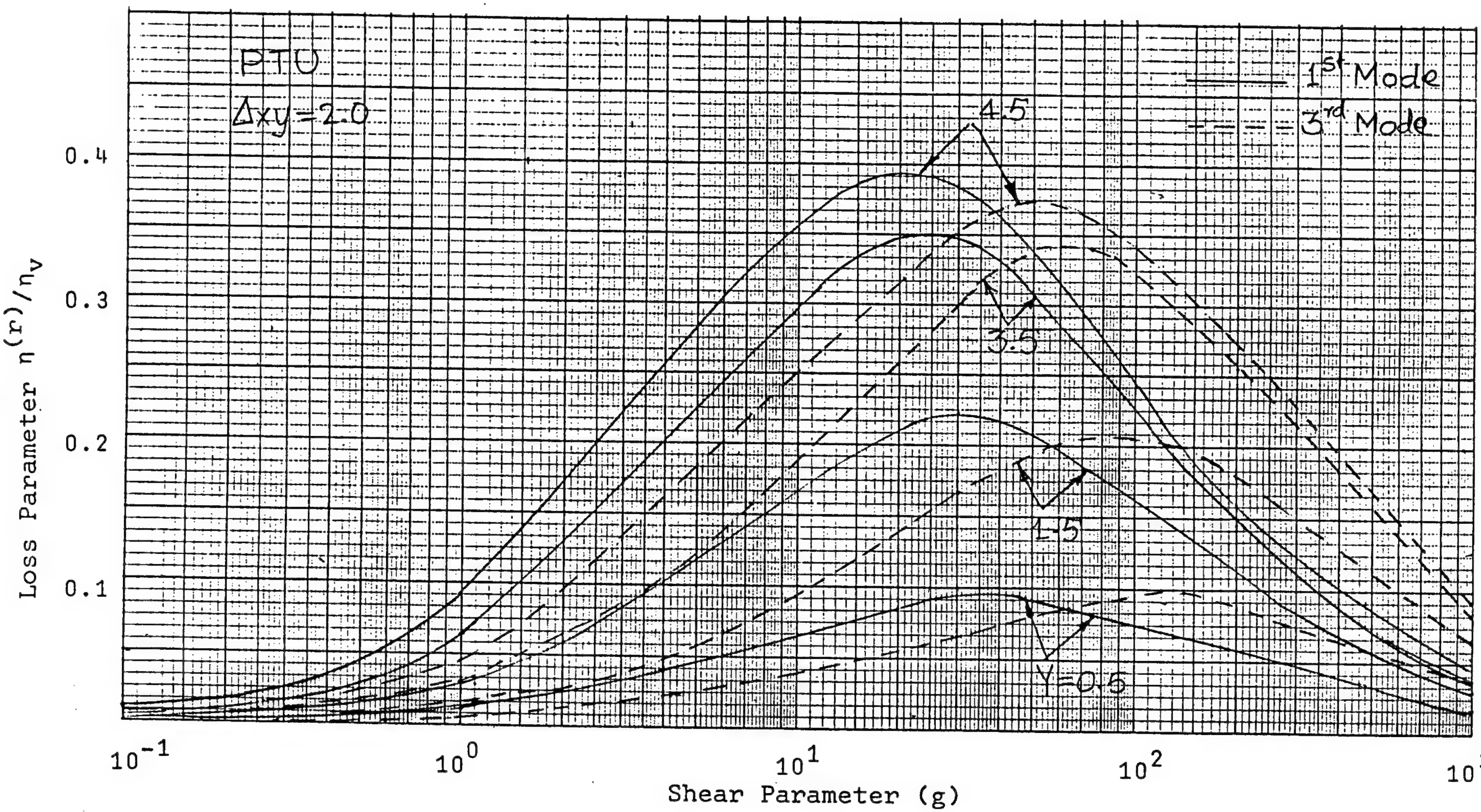

Figure 11 Damping of a sandwich rectangular plate, PTU boundary conditions, Δxy = 2.0, modes 1 and 3, variable Y and g

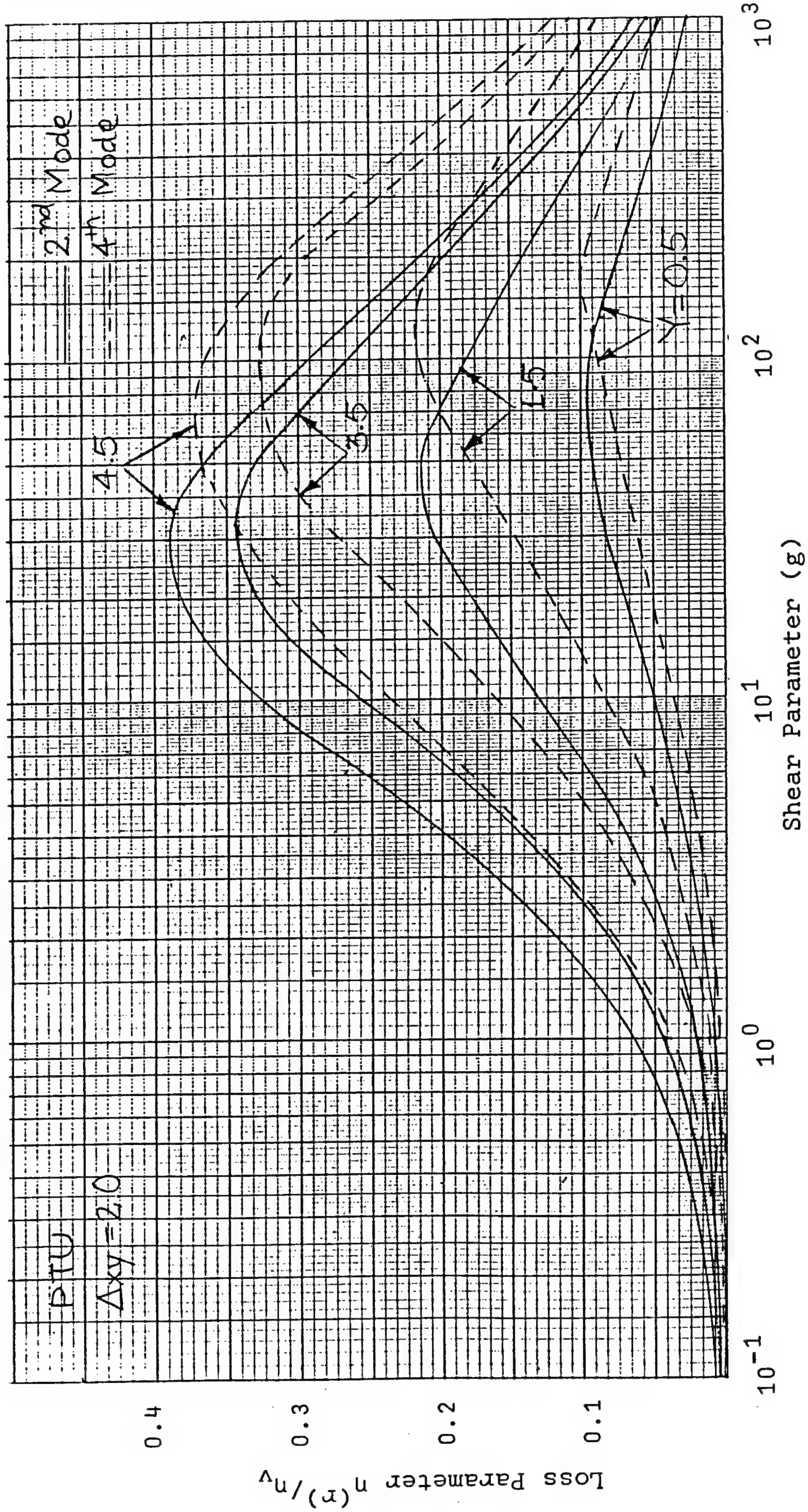

Figure 12 Damping of a sandwich rectangular plate, PTU boundary conditions, Δxy = 2.0, modes 2 and 4, variable Y and g

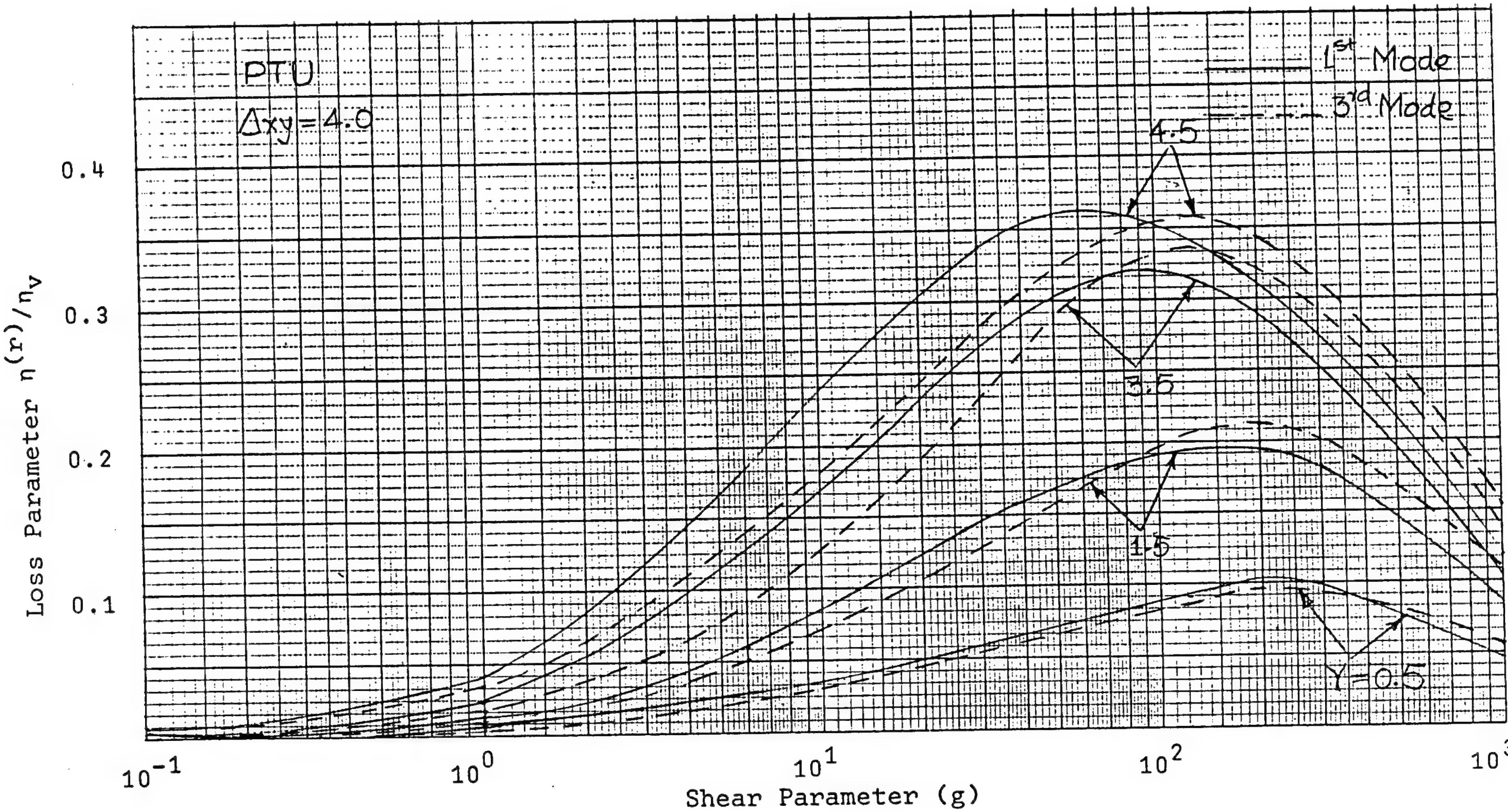

Figure 13 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, modes 1 and 3, variable Y and g

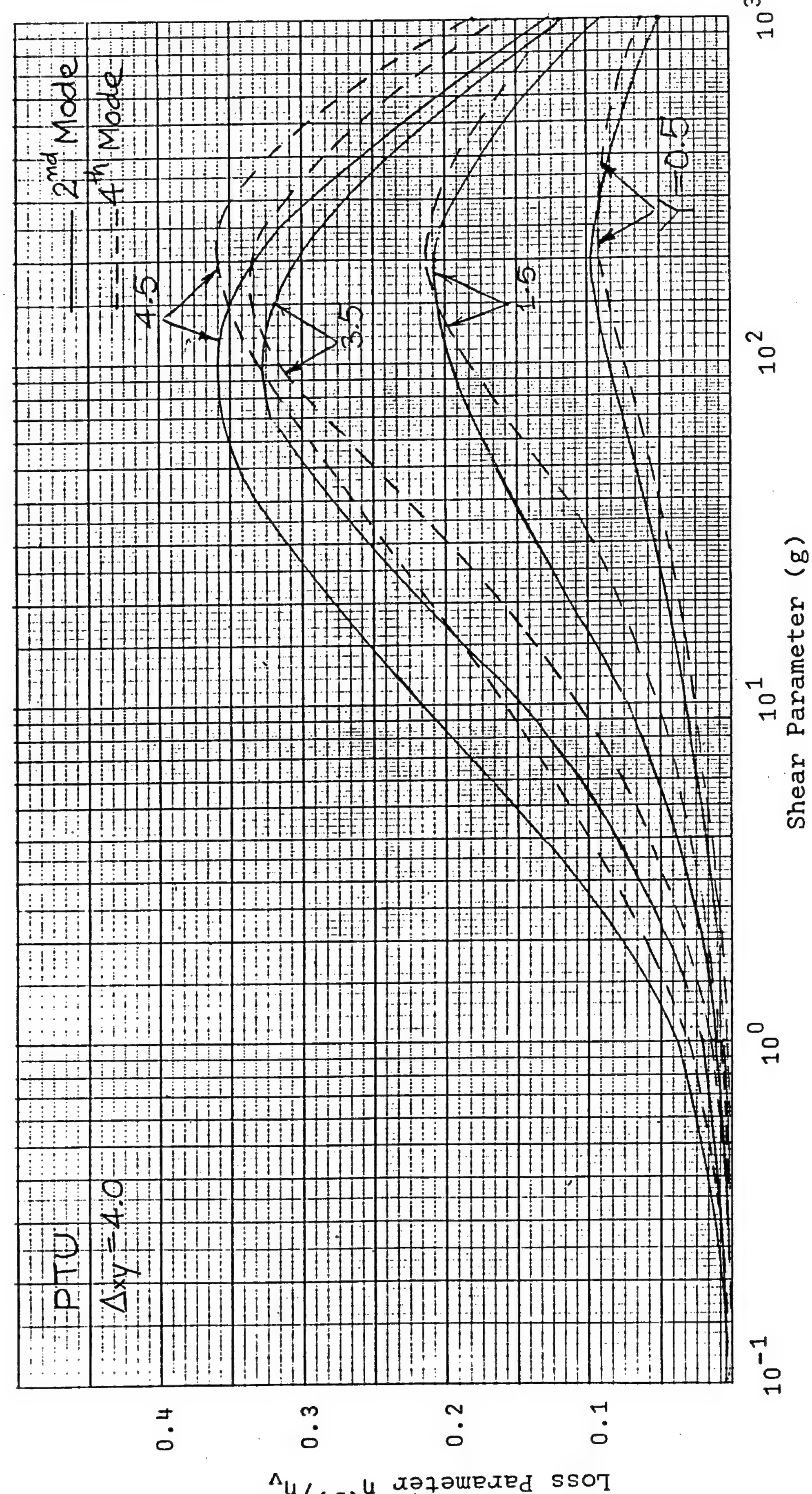

Figure 14 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, modes 2 and 4, variable Y and g

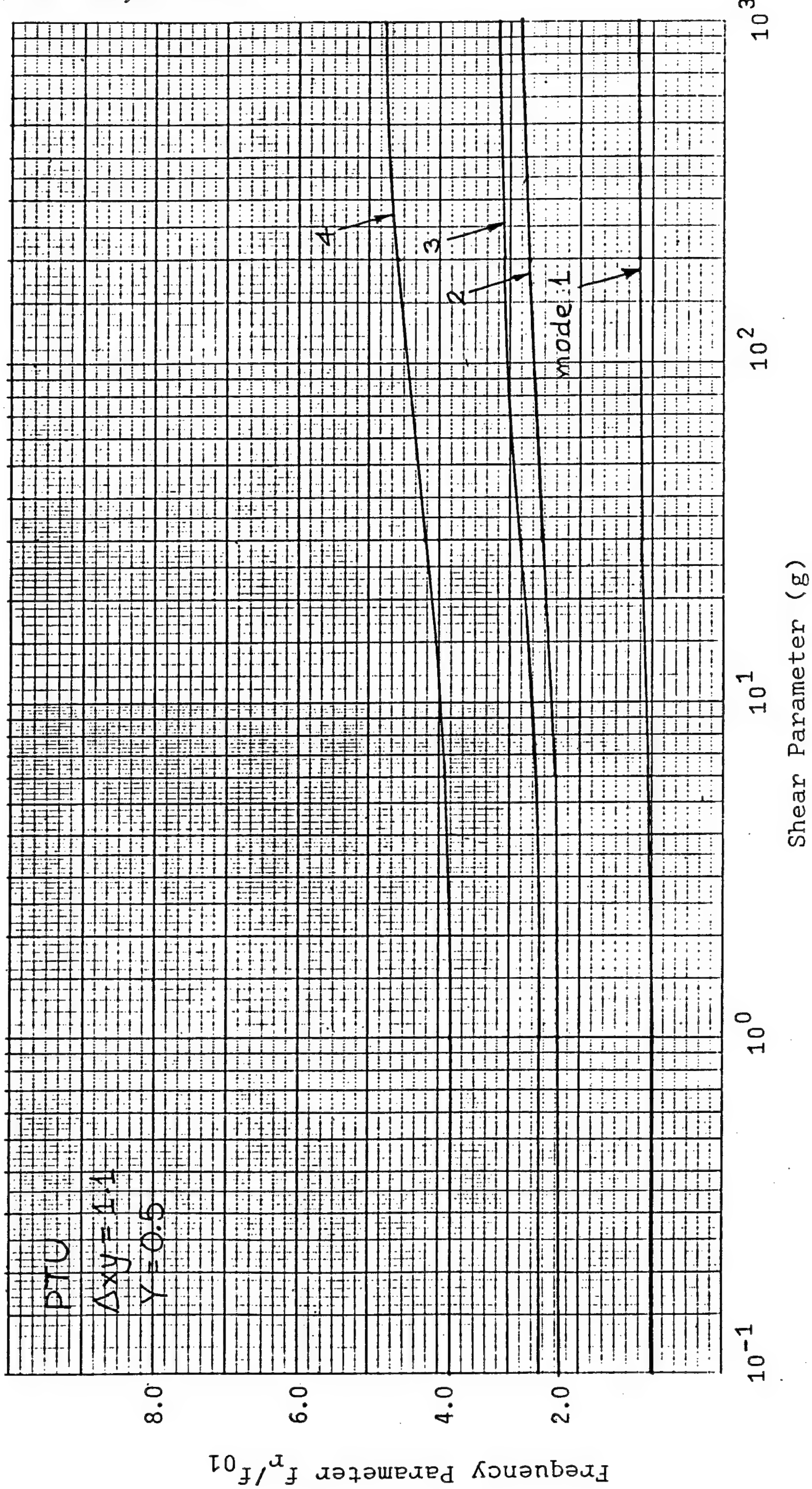

Figure 15 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, Δxy = 1.1, Y = 0.5

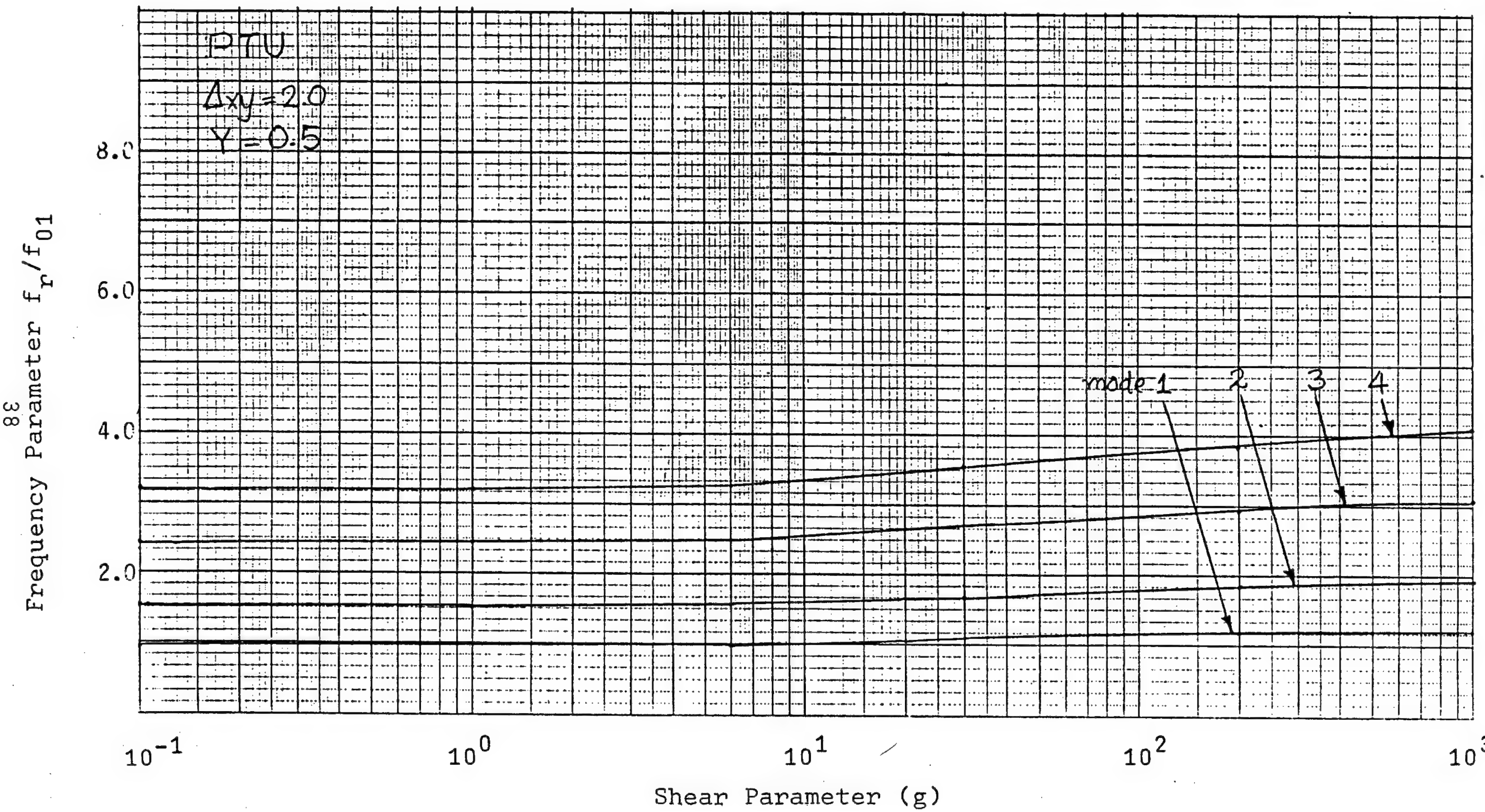

Figure 16 Natural frequencies of sandwich rectangular plate, PTU boundary condition, $\Delta xy = 2.0$, $Y = 0.5$

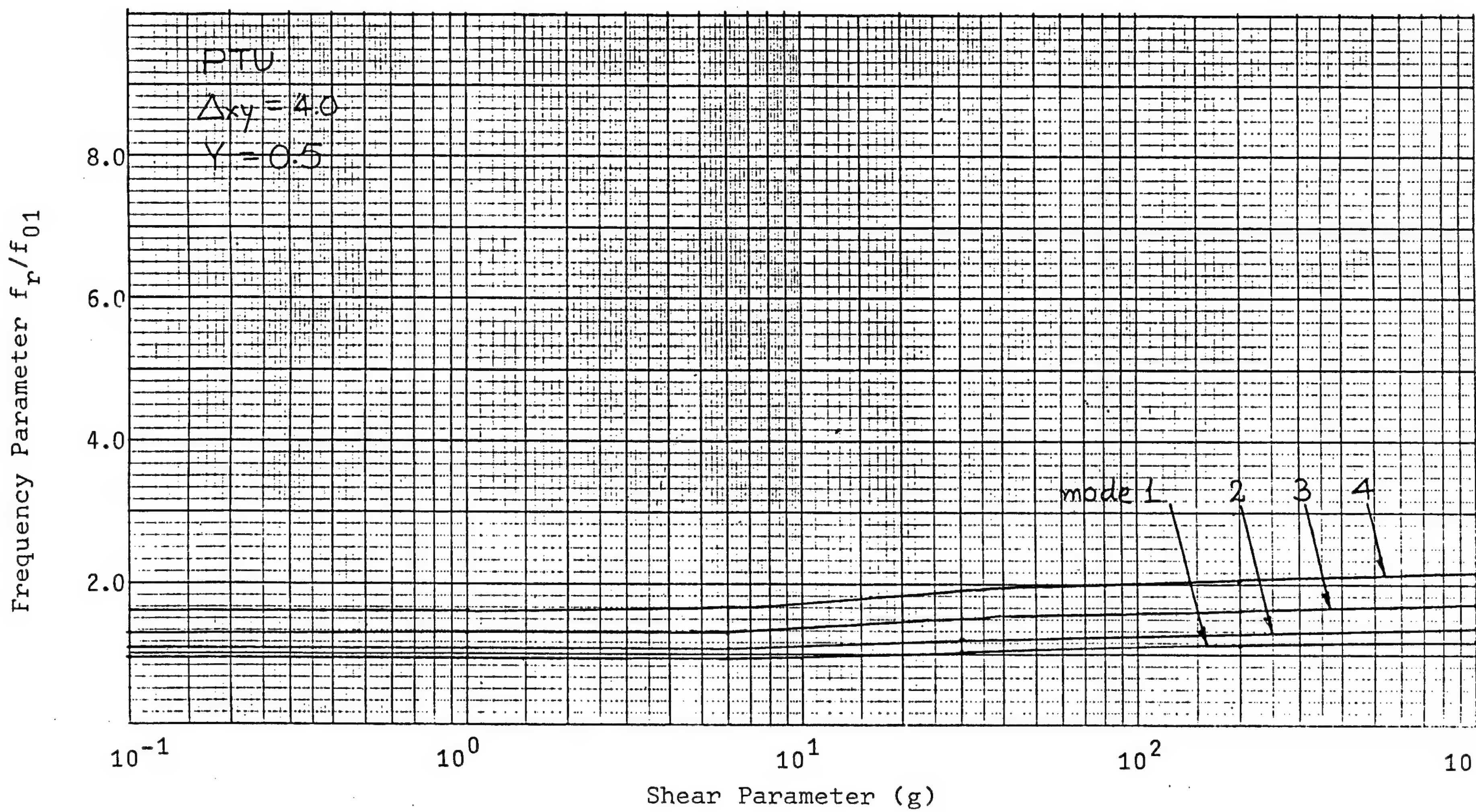

Figure 17 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, Δxy = 4.0, Y = 0.5

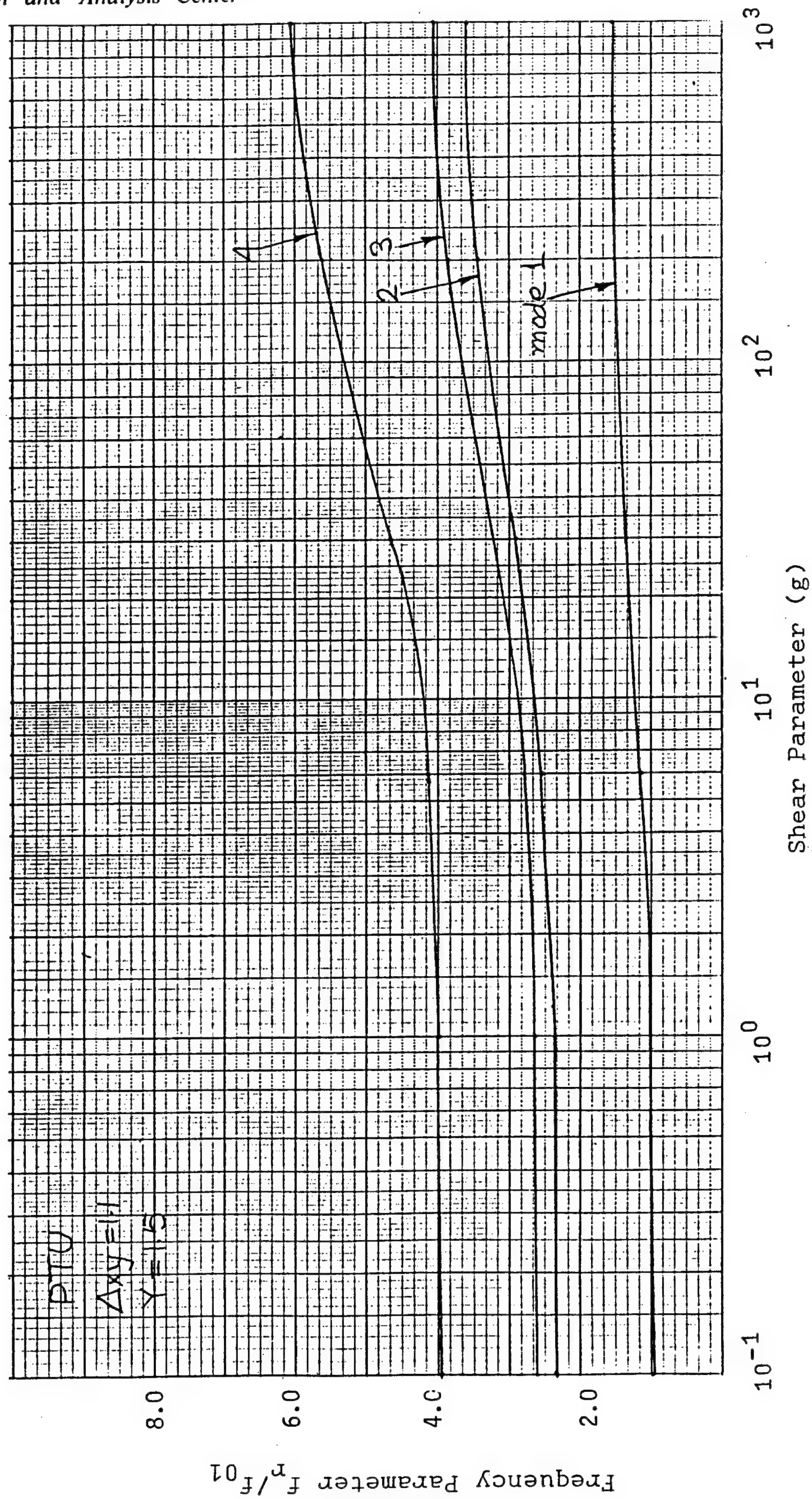

Figure 18 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 1.1$, $Y = 1.5$

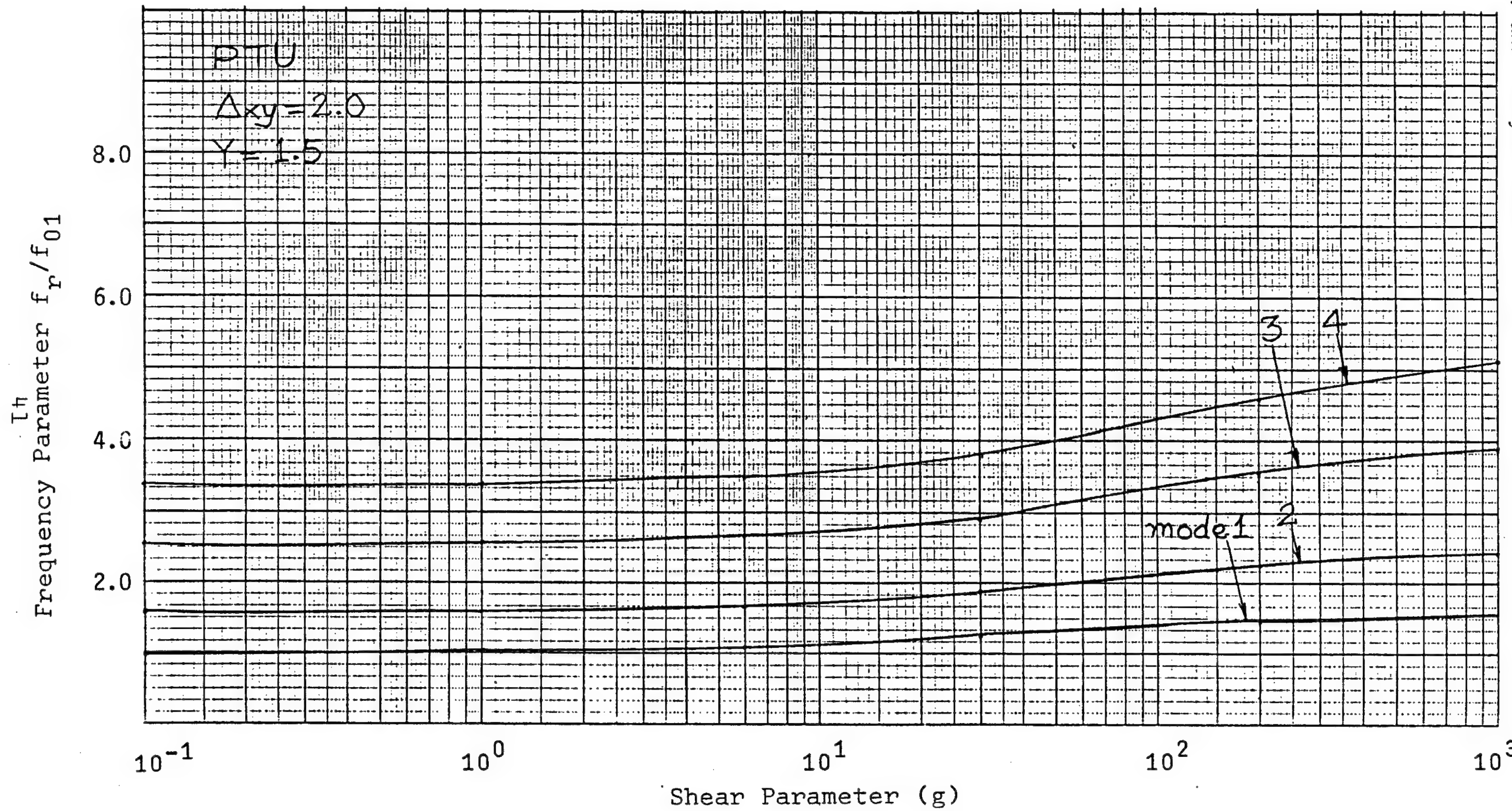

Figure 19 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 2.0$, $Y = 1.5$

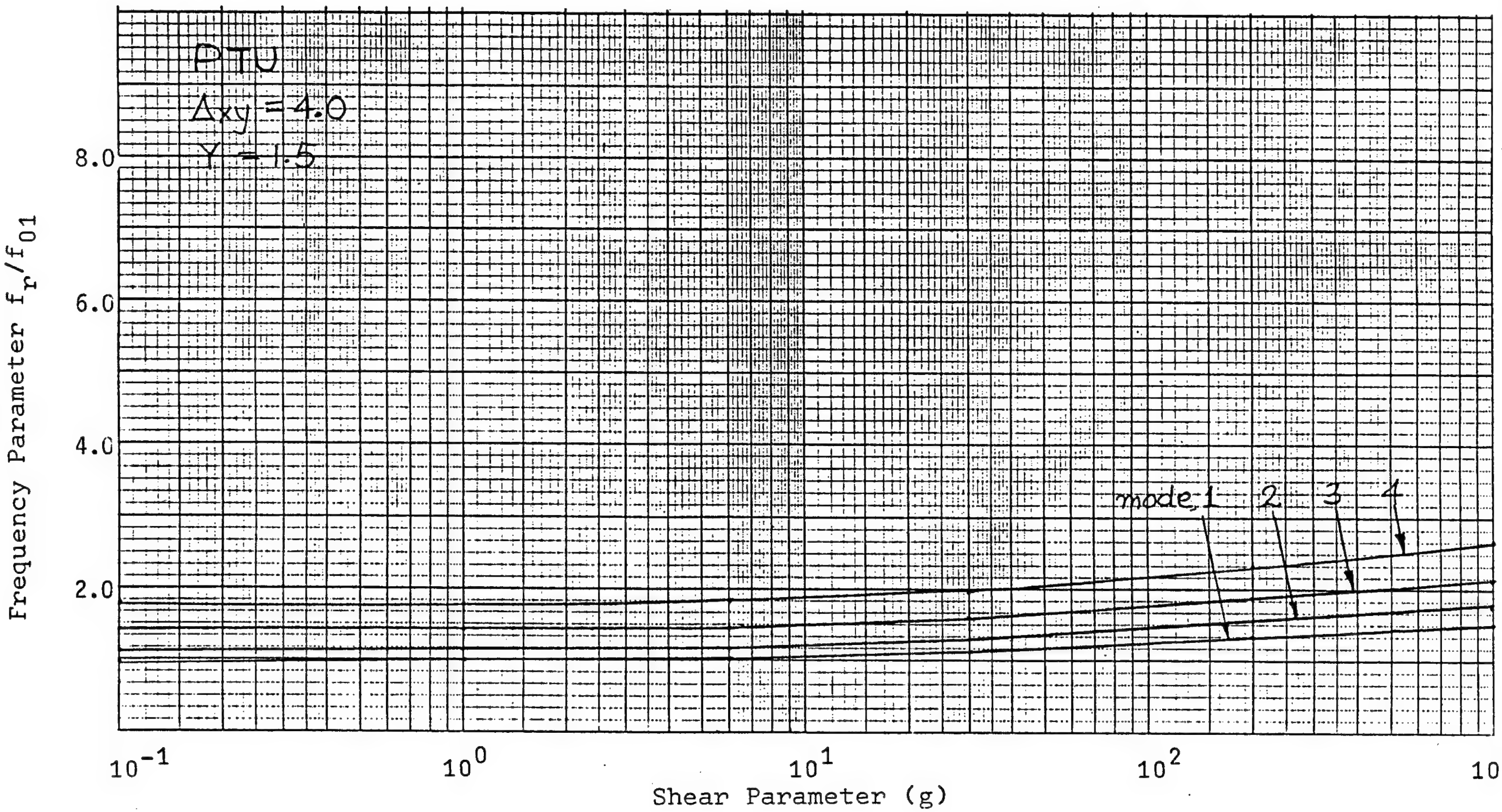

Figure 20 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, $Y = 1.5$

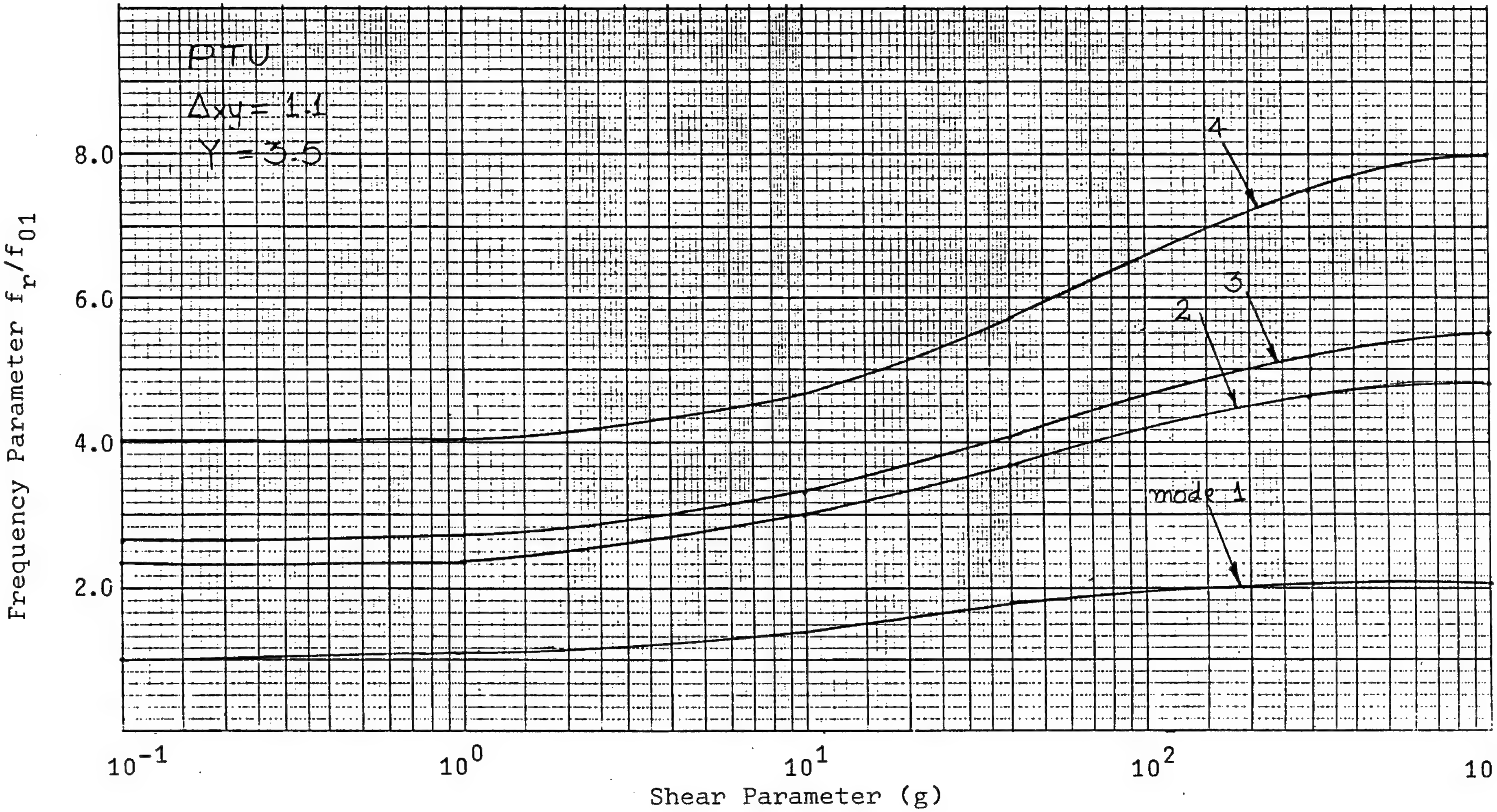

Figure 21 Natural frequencies of sandwich plate, PTU boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

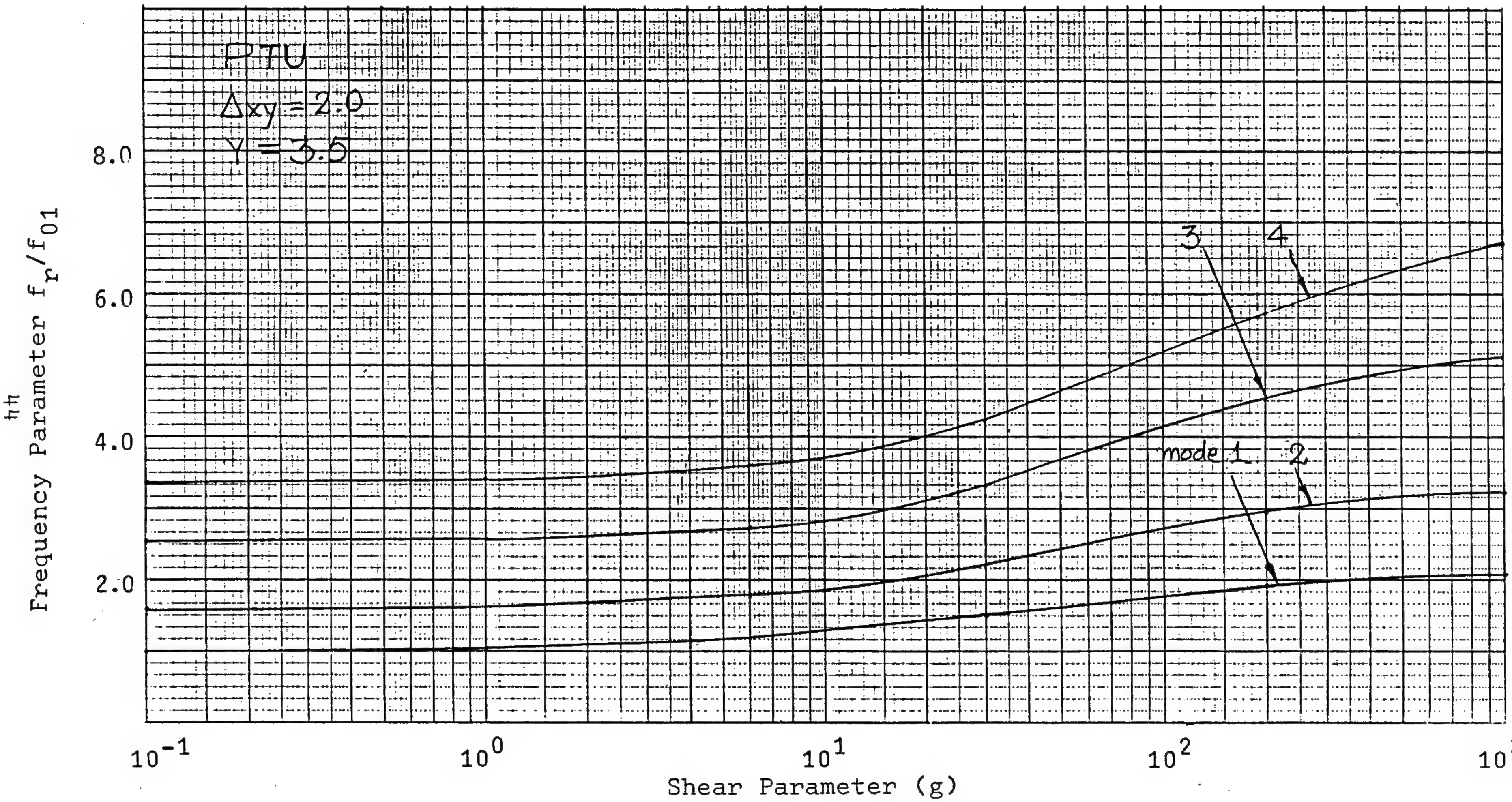

Figure 22 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

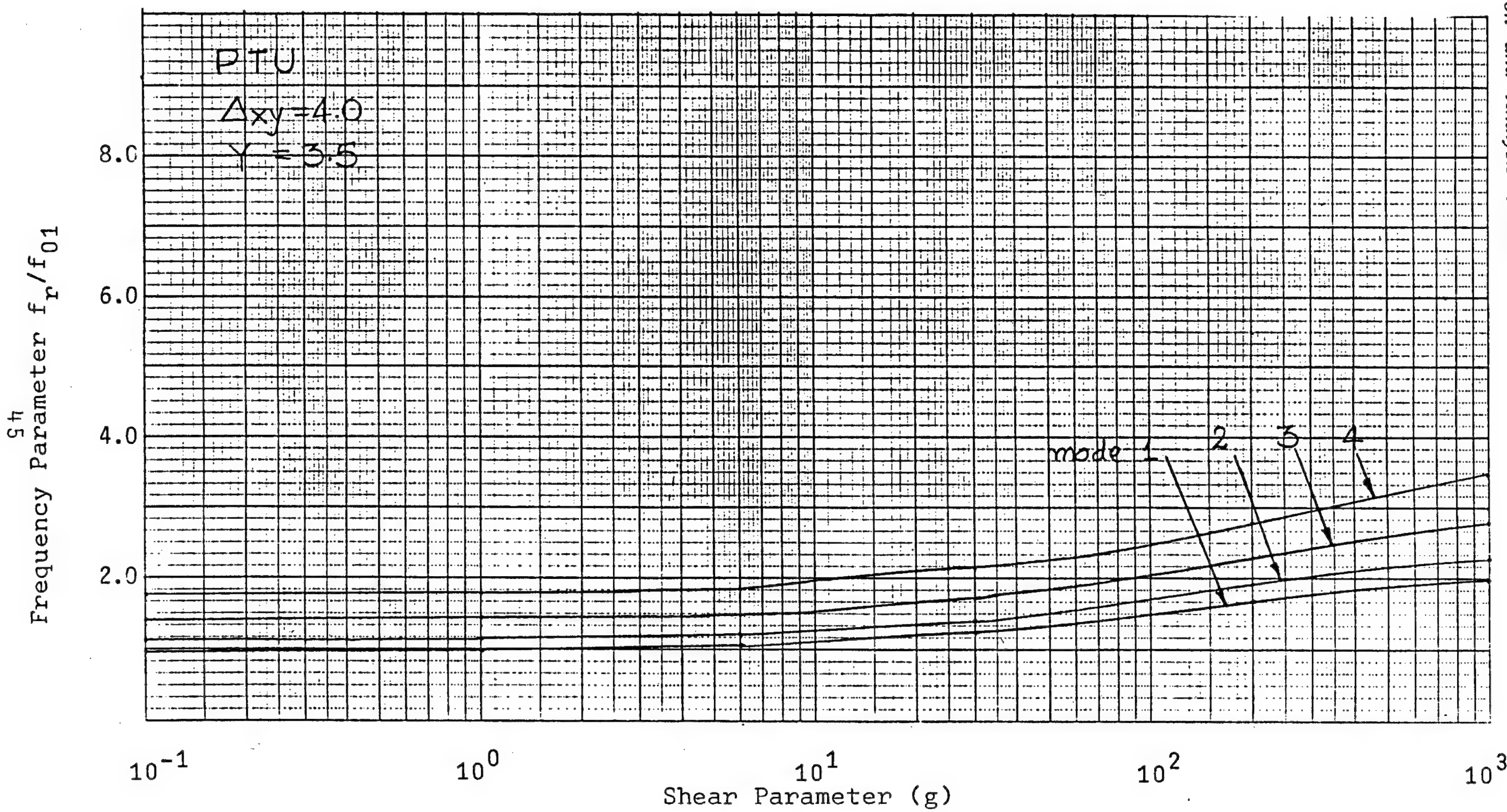

Figure 23 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

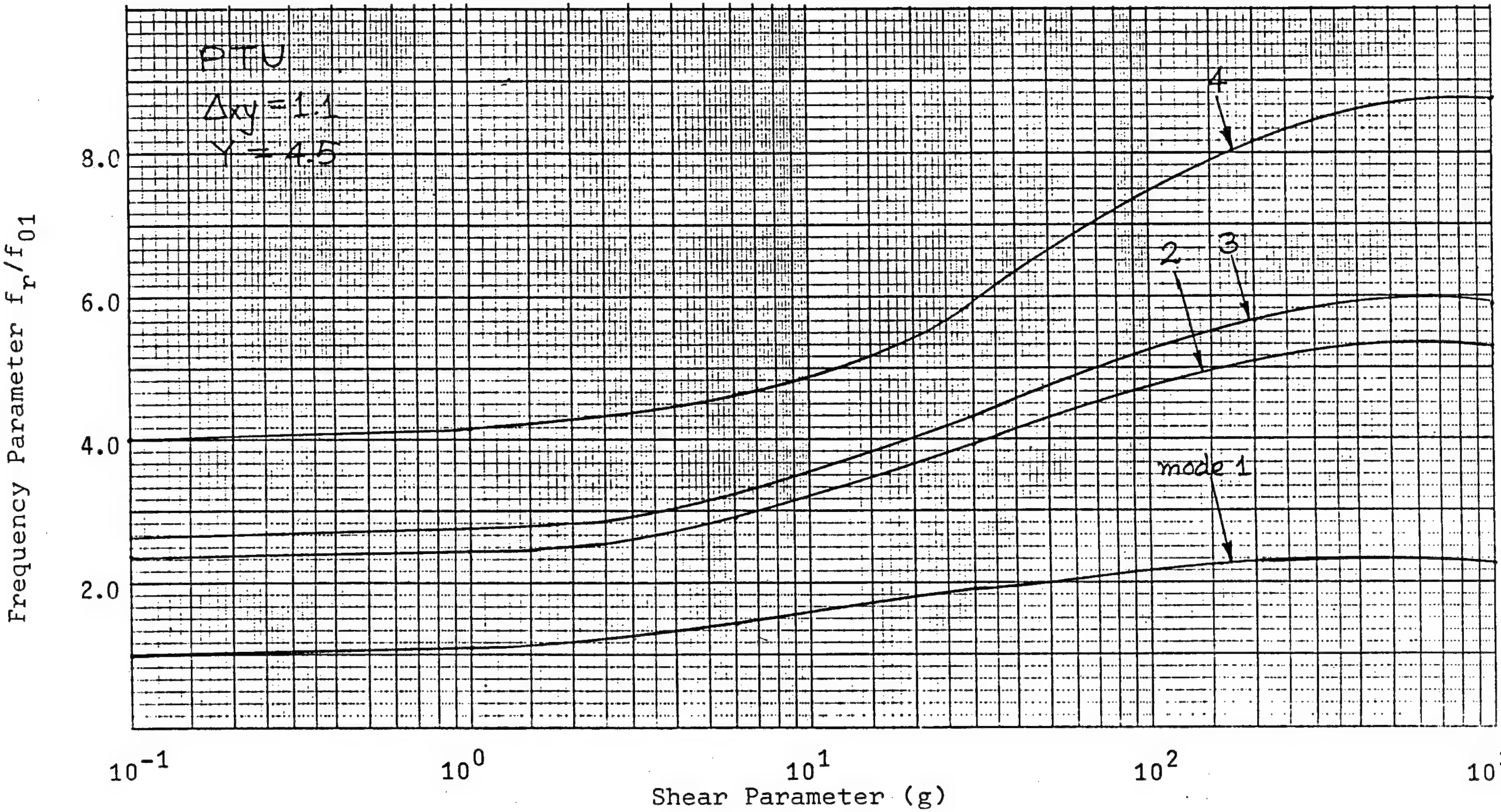

Figure 24 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, Δxy = 1.1, Y = 4.5

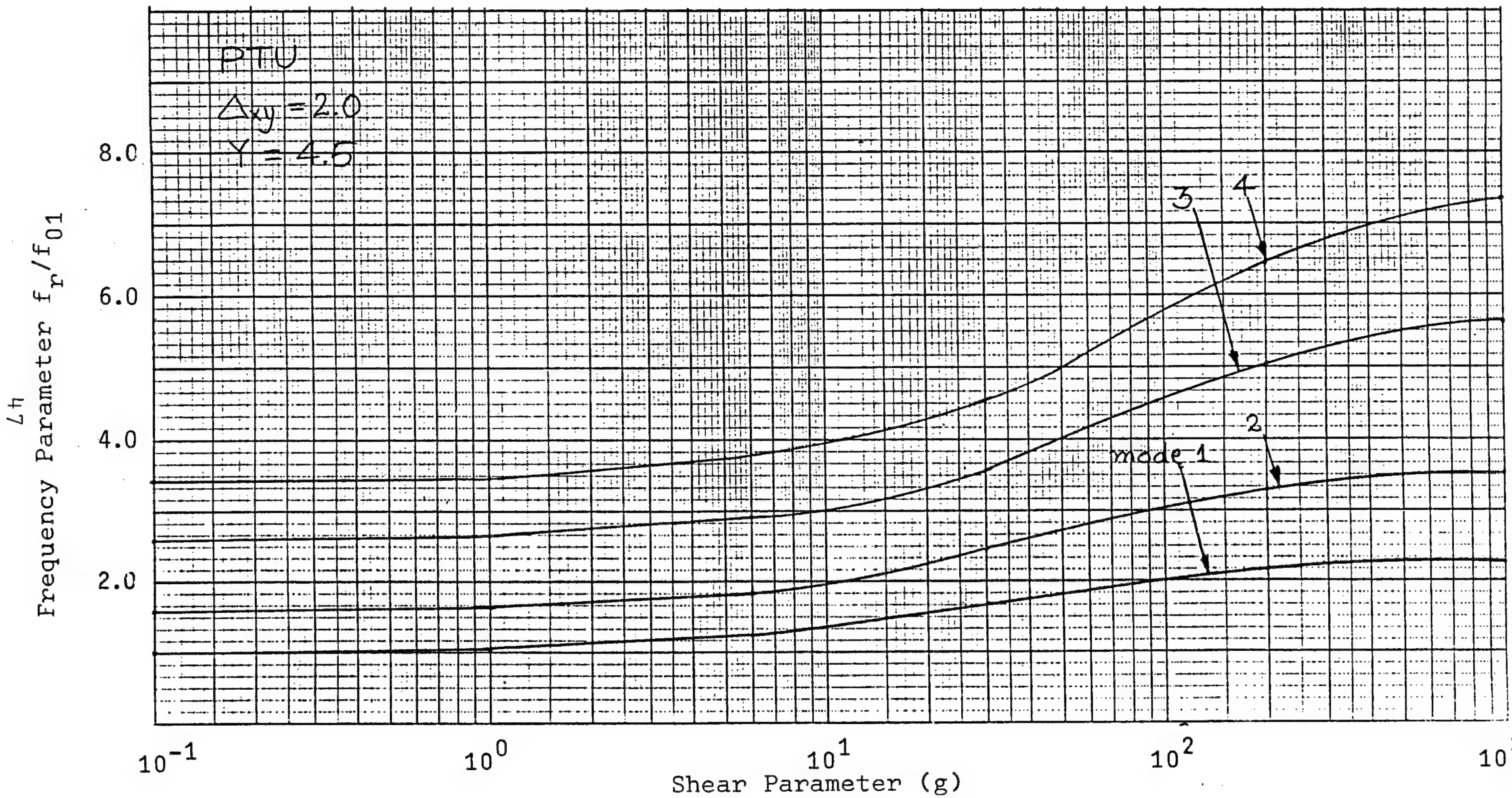

Figure 25 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, Δxy = 2.0, Y = 4.5

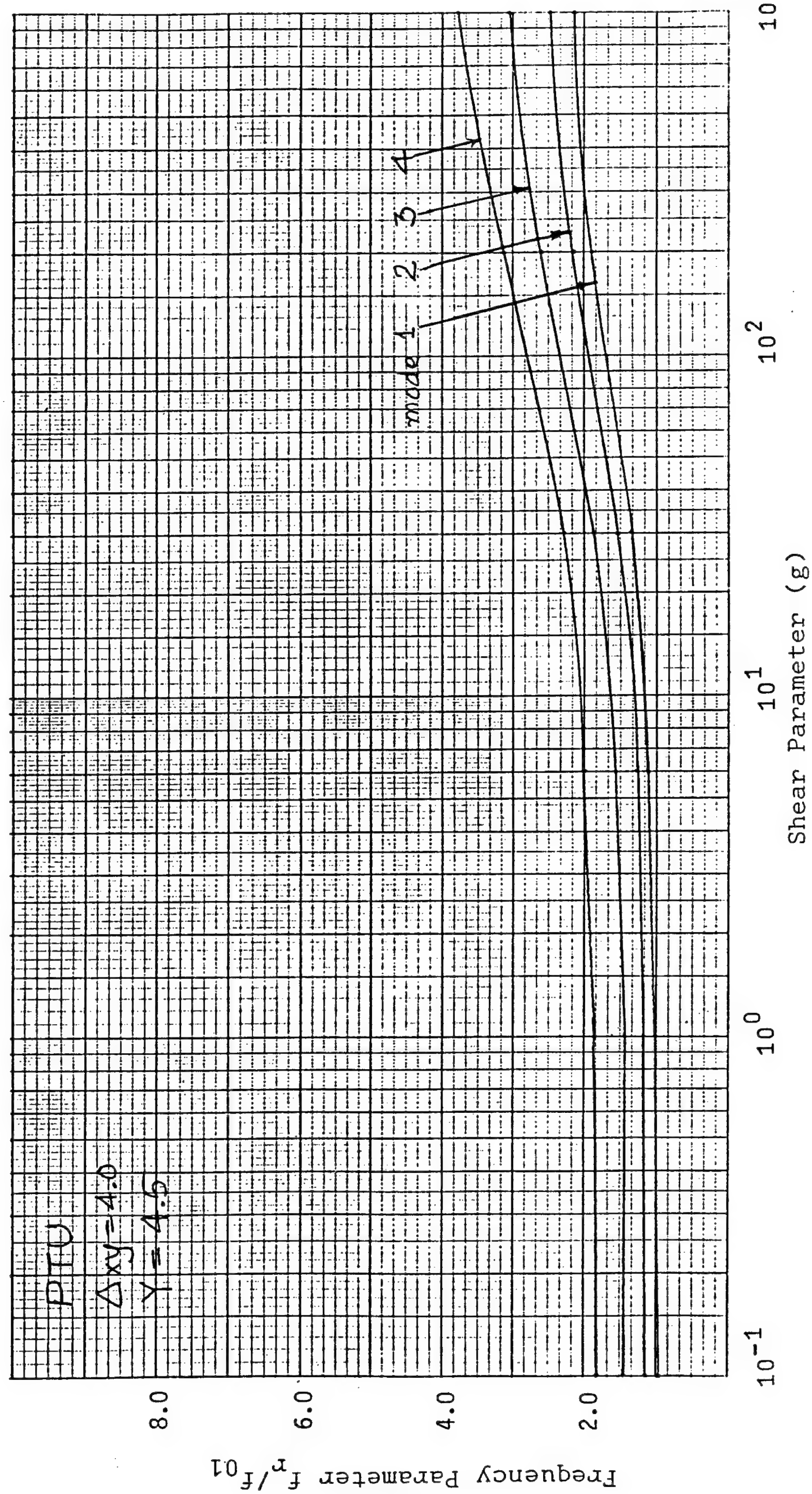

Figure 26 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, $Y = 4.5$

TABLE 6

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Υ) = 0.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)
1	816.	0.002	825.	0.022	860.	0.077	91.	0.094	96.	0.031	97.	0.008
2	1915.	0.001	1926.	0.011	1974.	0.050	206.	0.095	223.	0.058	230.	0.019
3	2144.	0.001	2155.	0.010	2206.	0.047	230.	0.093	250.	0.062	257.	0.021
4	3213.	0.001	3225.	0.007	3282.	0.035	342.	0.078	372.	0.074	387.	0.027
5	3738.	0.001	3751.	0.007	3814.	0.034	397	0.073	432.	0.082	452.	0.037
6	4337.	0.001	4351.	0.006	4420.	0.032	459.	0.068	500.	0.087	526.	0.042
7	4987.	0.001	5001.	0.005	5070.	0.027	533.	0.059	577.	0.085	606.	0.040
8			5372.	0.005	5444.	0.026	571.	0.057	618.	0.087	652.	0.043
9					7081.	0.021	677.	0.049	731.	0.091	777.	0.060
10							759.	0.045	814.	0.087	861.	0.049

TABLE 7

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Υ) = 1.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)
1	465.	0.007	479.	0.060	534.	0.190	102.	0.194	114.	0.056	117.	0.014
2	1098.	0.003	1112.	0.029	1183.	0.123	220.	0.218	261.	0.110	275.	0.032
3	1229.	0.003	1245.	0.026	1318.	0.116	244.	0.217	291.	0.119	308.	0.035
4	1856.	0.002	1872.	0.018	1950.	0.085	353.	0.192	426.	0.147	458.	0.048
5	2166.	0.002	2182.	0.016	2263.	0.078	405.	0.183	491.	0.165	535.	0.061
6	2519.	0.002	2536.	0.014	2622.	0.071	466.	0.172	565.	0.177	622.	0.069
7	2917.	0.001	2934.	0.012	3018.	0.060	535.	0.153	643.	0.177	709.	0.071
8	3135.	0.001	3153.	0.011	3241.	0.0576	572.	0.149	688.	0.183	763.	0.076
9	3739.	0.001	3758.	0.010	3854.	0.0515	671.	0.130	806.	0.193	908.	0.098
10			7167.	0.009	4258.	0.0455	748.	0.120	884.	0.191	993.	0.090

TABLE 8

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		10.		40.		300.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	526.	0.016	561.	0.127	753.	0.346	167.	0.242	191.	0.051	194.	0.017
2	1238.	0.007	1276.	0.062	1547.	0.293	347.	0.331	434.	0.108	452.	0.038
3	1387.	0.006	1425.	0.056	1709.	0.283	382.	0.339	485.	0.119	507.	0.042
4	2091.	0.004	2130.	0.038	2443.	0.227	535.	0.336	705.	0.156	751.	0.059
5	2439.	0.004	2478.	0.033	2805.	0.212	606.	0.337	813.	0.1812	874.	0.071
6	2835.	0.003	2876.	0.030	3222.	0.196	689.	0.330	936.	0.200	1015.	0.082
7	3281.	0.003	3321.	0.025	3663.	0.170	776.	0.307	1053.	0.208	1149.	0.088
8	3526.	0.002	3567	0.023	3921.	0.164	826.	0.303	1127.	0.219	1237.	0.095
9	4203.	0.002	4246.	0.020	4626.	0.145	956.	0.278	1320.	0.241	1468.	0.114
10	4661.	0.002	4701.	0.018	5061.	1.132	1048.	0.266	1424.	0.249	1589.	0.117

TABLE 9

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 4.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	352.	0.021	383.	0.165	492.	0.378	150.	0.300	178.	0.080	129.	0.023
2	829.	0.010	865.	0.088	1020.	0.296	305.	0.382	398.	0.158	300.	0.045
3	929.	0.009	966.	0.081	1128.	0.284	334.	0.387	443.	0.172	336.	0.050
4	1405.	0.006	1445.	0.059	1630.	0.230	465.	0.374	638.	0.217	498.	0.069
5	1639.	0.006	1681.	0.053	1880.	0.217	526.	0370.	731.	0.246	579.	0.081
6	1907.	0.005	1952.	0.049	2166.	0.204	598.	0.359	837.	0.267	672.	0.092
7	2214.	0.005	2259.	0.042	2477.	0.181	672.	0.332	939.	0.275	762.	0.100
8	2380.	0.004	2427.	0.041	2655.	0.177	715.	0.326	1002.	0.285	820.	0.106
9	2837.	0.004	2889.	0.036	3143.	0.163	827.	0.298	1167.	0.305	972.	0.127
10	3165.	0.003	3215.	0.033	3462.	0.149	907.	0.284	1256.	0.313	1053.	0.130

TABLE 10

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (γ) = 0.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	1825.	0.001	1836.	0.012	1883.	0.052	197.	0.098	214.	0.057	220.	0.018
2	2873.	0.001	2884.	0.008	2939.	0.039	309.	0.085	337.	0.073	349.	0.025
3	4618.	0.001	4632.	0.006	4700.	0.030	496.	0.067	539.	0.087	566.	0.037
4	6085.	0.001	6102.	0.005	6181.	0.026	649.	0.055	703.	0.096	747.	0.053
5	6977.	0.001	6996.	0.005	7080.	0.024	758.	0.048	816.	0.094	868.	0.053
6	7062.	0.001	7082.	0.005	7168.	0.023	762.	0.048	821.	0.093	873.	0.054
7			8664.	0.004	8755.	0.020	947.	0.039	1012.	0.090	1079.	0.057
8					10284.	0.020	1114.	0.034	1186.	0.090	1272.	0.070
9					10890.	0.017	1210.	0.031	1281.	0.085	1366.	0.063
10							1449.	0.027	1531.	0.087	1654.	0.091

TABLE 11

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Y) = 1.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	1047.	0.003	1062.	0.030	1132.	0.129	212.	0.222	251.	0.108	264.	0.030
2	1664.	0.002	1680.	0.020	1757.	0.095	322.	0.205	388.	0.143	416.	0.044
3	2702.	0.002	2720.	0.013	2806.	0.067	501.	0.168	606.	0.179	668.	0.066
4	3569.	0.002	3588.	0.011	3685.	0.057	647.	0.146	781.	0.200	878.	0.090
5	4148.	0.001	4168.	0.009	4266.	0.050	749.	0.130	895.	0.203	1012.	0.095
6	4178.	0.001	4198.	0.009	4298.	0.049	753.	0.129	900.	0.200	1019.	0.096
7	5172.	0.001	5194.	0.008	5297.	0.041	927.	0.108	1093.	0.200	1245.	0.106
8			6029.	0.007	6240.	0.038	1084.	0.094	1269.	0.200	1465.	0.125
9			6124.	0.006	6678.	0.034	1172.	0.087	1356.	0.196	1557.	0.120
10					8098.	0.034	1398.	0.076	1609.	0.200	1887.	0.159

TABLE 12

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	1182.	0.007	1219.	0.066	1389.	0.245	320.	0.350	408.	0.145	436.	0.036
2	1875.	0.005	1914.	0.043	2100.	0.186	469.	0.344	622.	0.197	683.	0.055
3	3041.	0.003	3082.	0.028	3289.	0.134	703.	0.304	955.	0.255	1089.	0.083
4	4013.	0.003	4057.	0.023	4284.	0.112	891.	0.274	1215.	0.294	1427.	0.109
5	4663.	0.002	4706.	0.019	4932.	0.098	1019.	0.25	1374.	0.303	1632.	0.120
6	4696.	0.002	4740.	0.019	4971.	0.097	1025.	0.248	1387.	0.300	1649.	0.121
7	5808.	0.002	5854.	0.015	6090.	0.080	1242.	0.213	1653.	0.308	1996.	0.137
8	6846.	0.001	6894.	0.014	7151.	0.072	1439.	0.190	1903.	0.316	2343.	0.158
9	7342.	0.001	7387.	0.012	7630.	0.065	1546.	0.177	2008.	0.313	2465.	0.159
10			8948.	0.012	9235.	0.061	1831.	0.156	2367.	0.328	2987.	0.197

TABLE 13

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Y) = 4.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	792.	0.011	828.	0.093	982.	0.306	295.	0.386	384.	0.155	289.	0.044
2	1261.	0.007	1301.	0.066	1482.	0.250	429.	0.389	584.	0.210	453.	0.064
3	2052.	0.005	2098.	0.047	2319.	0.198	638.	0.354	894.	0.271	722.	0.094
4	2712.	0.004	2765.	0.040	3020.	0.178	803.	0.326	1136.	0.313	944.	0.120
5	3165.	0.004	3220.	0.036	3486.	0.162	915.	0.300	1283.	0.324	1079.	0.132
6	3183.	0.004	3238.	0.036	3509.	0.160	920.	0.299	1296.	0.322	1091.	0.134
7	3958.	0.003	4017.	0.030	4309.	0.141	1110.	0.262	1541.	0.333	1320.	0.151
8	4670.	0.003	4736.	0.029	5069.	0.134	1283.	0.239	1774.	0.345	1547.	0.172
9	5038.	0.003	5102.	0.026	5424.	0.124	1375.	0.224	1868.	0.343	1631.	0.175
10	6096.	0.003	6181.	0.025	6584.	0.024 √	1626.	0.203	2206.	0.362	1968.	0.212

TABLE 14

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 0.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	5968.	0.010	5986.	0.006	6068.	0.028	642.	0.059	697.	0.097	739.	0.048
2	6885.	0.001	6904.	0.005	6990.	0.025	750.	0.052	811.	0.097	863.	0.051
3	8436.	0.001	8459.	0.004	8554.	0.022	933.	0.044	1002.	0.096	1069.	0.057
4	10513.	0.002	10545.	0.004	10653.	0.020	1188.	0.036	1266.	0.093	1355.	0.064
5	11583.	0.002	11612.	0.004	13508.	0.017	1525.	0.028	1611.	0.087	1730.	0.073
6			13377.	0.003	16841.	0.016	1942.	0.022	2036.	0.079	2186.	0.080
7			13587.	0.003	20602.	0.015	2446.	0.018	2545.	0.070	2732.	0.087
8					20684.	0.014	2481.	0.018	2585.	0.073	2792.	0.101
9							2596.	0.017	2699.	0.070	2910.	0.098
10							2784.	0.06	2888.	0.067	3105.	0.096

TABLE 15

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 1.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.12		1.2		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	3514.	0.002	3537.	0.014	3631.	0.060	641.	0.153	778.	0.203	873.	0.085
2	4090.	0.002	4114.	0.012	4211.	0.053	744.	0.138	896.	0.208	1014.	0.093
3	5060.	0.002	5087.	0.010	5190.	0.045	916.	0.118	1090.	0.212	1246.	0.106
4	6399.	0.002	6430.	0.009	6541.	0.039	1157.	0.098	1355.	0.212	1564.	0.123
5	8182.	0.003	8220.	0.007	8345.	0.033	1473.	0.079	1697.	0.204	1976.	0.142
6	10330.	0.003	10381.	0.006	10522.	0.028	1864.	0.064	2110.	0.191	2470.	0.159
7			12504.	0.005	13105.	0.025	2337.	0.051	2600.	0.175	3050.	0.175
8			12943.	0.006	13444.	0.027	2370.	0.051	2644.	0.081	3128.	0.192
9			13260.	0.006	14004.	0.026	2477.	0.049	2752.	0.174	3249.	0.189
10					14835.	0.024	2654.	0.045	2930.	0.168	3445.	0.190

TABLE 16

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	3950.	0.003	3996.	0.024	4228.	0.119	888.	0.286	1217.	0.295	1427.	0.107
2	4595.	0.002	4641.	0.021	4877.	0.105	1018.	0.263	1387.	0.307	1648.	0.120
3	5626.	0.002	5730.	0.017	5976.	0.089	1235.	0.232	1663.	0.322	2012.	0.140
4	5682.	0.002	7229.	0.014	7489.	0.075	1536.	0.1978	2030.	0.333	2503.	0.165
5	7180.	0.001	9228.	0.012	9516.	0.062	1932.	0.164	2498.	0.332	3140.	0.191
6	9174.	0.001	11636.	0.010	11952.	0.052	2418.	0.134	3049.	0.321	3887.	0.217
7	11575.	0.001	14484.	0.008	14835.	0.044	3004.	0.108	3690.	0.304	4747.	0.241
8	14420.	0.001	14832.	0.008			3049.	0.110	3760.	0.313	4885.	0.257
9	14761.	0.001	15468.	0.008			3182.	0.104	3897.	0.303	5054.	0.255
10	15391.	0.001	16364.	0.008			3398.	0.100	4119.	0.295	5328.	0.261

TABLE 17

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Υ) = 4.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.0		200.0		1000.0	
	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)
1	2673.	0.005	2727.	0.042	2987.	0.185	801.	0.338	1138.	0.314	943.	0.118
2	3124.	0.004	3180.	0.038	3457.	0.171	915.	0.315	1296.	0.328	1090.	0.131
3	3882.	0.004	3943.	0.033	4249.	0.153	1105.	0.283	1551.	0.346	1330.	0.152
4	4936.	0.003	5006.	0.029	5351.	0.138	1369.	0.247	1890.	0.361	1654.	0.179
5	6333.	0.003	6414.	0.026	6816.	0.124	1714.	0.210	2324.	0.365	2073.	0.207
6	8040.	0.002	8133.	0.023	8605.	0.112	2138.	0.178	2833.	0.360	2563.	0.233
7	10082.	0.002	10191.	0.021	10745.	0.102	2650.	0.149	3426.	0.349	3127.	0.260
8	10306.	0.002	10426.	0.022	11481.	0.105	2691.	0.152	3499.	0.360	3210.	0.274
9					12224.	0.100	2806.	0.149	3624.	0.352	3322.	0.273
10							2995.	0.137	3827.	0.345	3505.	0.279

3.2.2 PLR Boundary Conditions

Damping properties of sandwich plates with PLR (fixed) boundary conditions are given in Figures 27 through 29. Only one value of the geometry parameter, Y = 3.5, is considered. This corresponds to the situation of equal face sheet thicknesses.

Natural frequencies of sandwich plates with PLR boundary conditions are given in Figures 30 through 32. Reference frequencies are given in Table 5.

A tabular presentation of the data for damping and natural frequencies of plates with PLR boundary conditions is given in Tables 18 through 20.

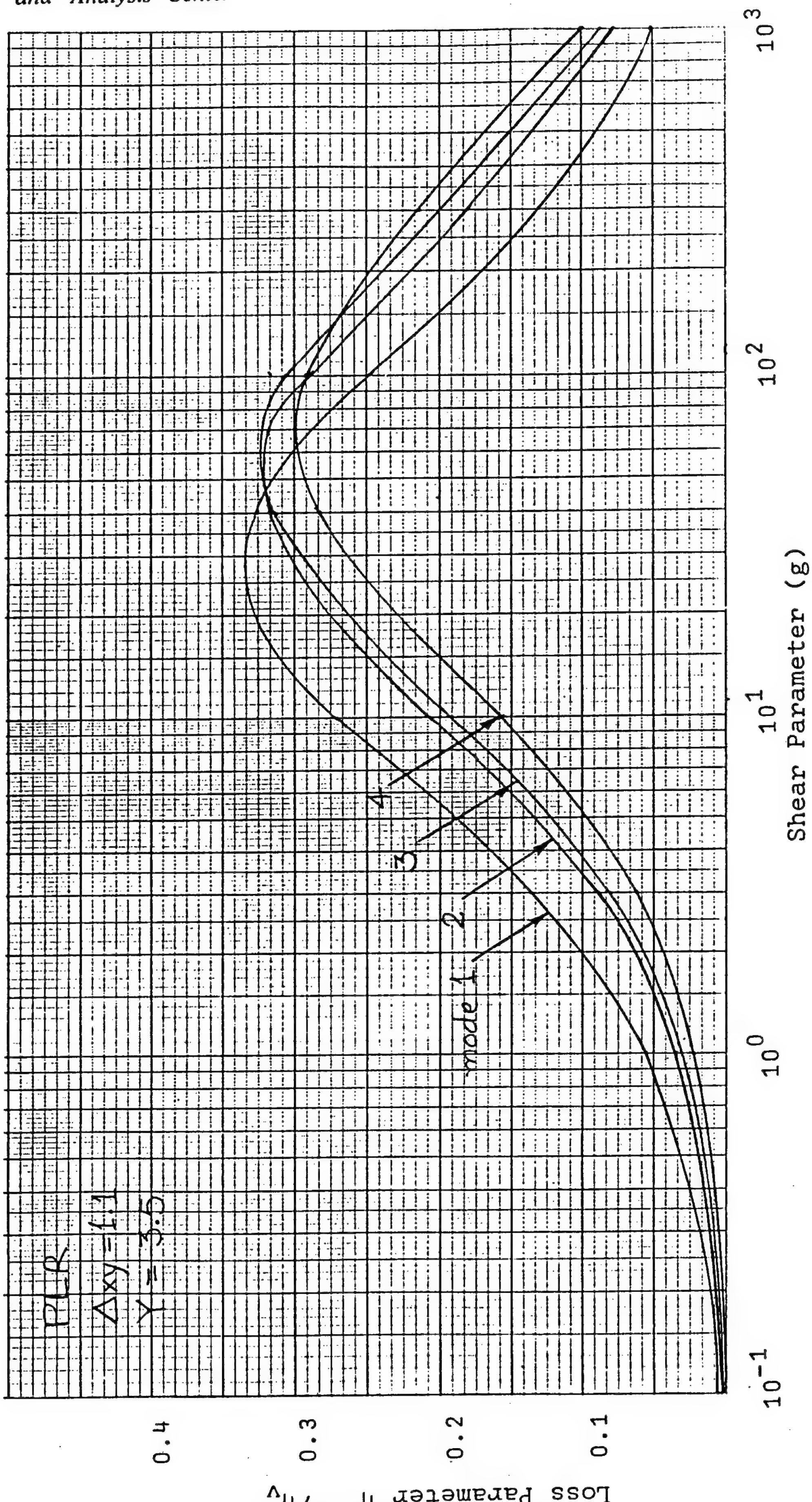

Figure 27 Damping of a sandwich rectangular plate, PLR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

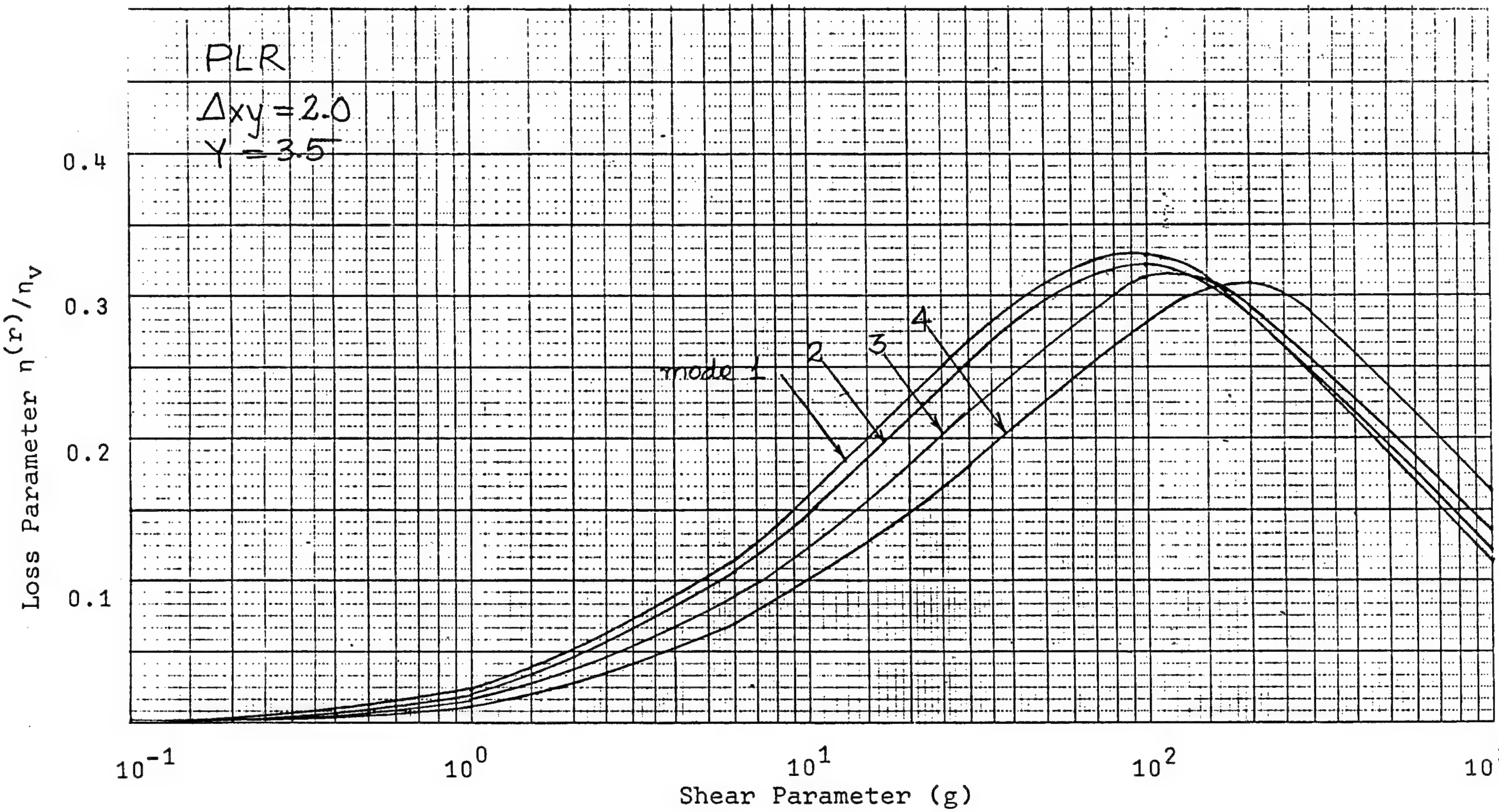

Figure 28 Damping of a sandwich rectangular plate, PLR boundary conditions, Δxy = 2.0, Y = 3.5

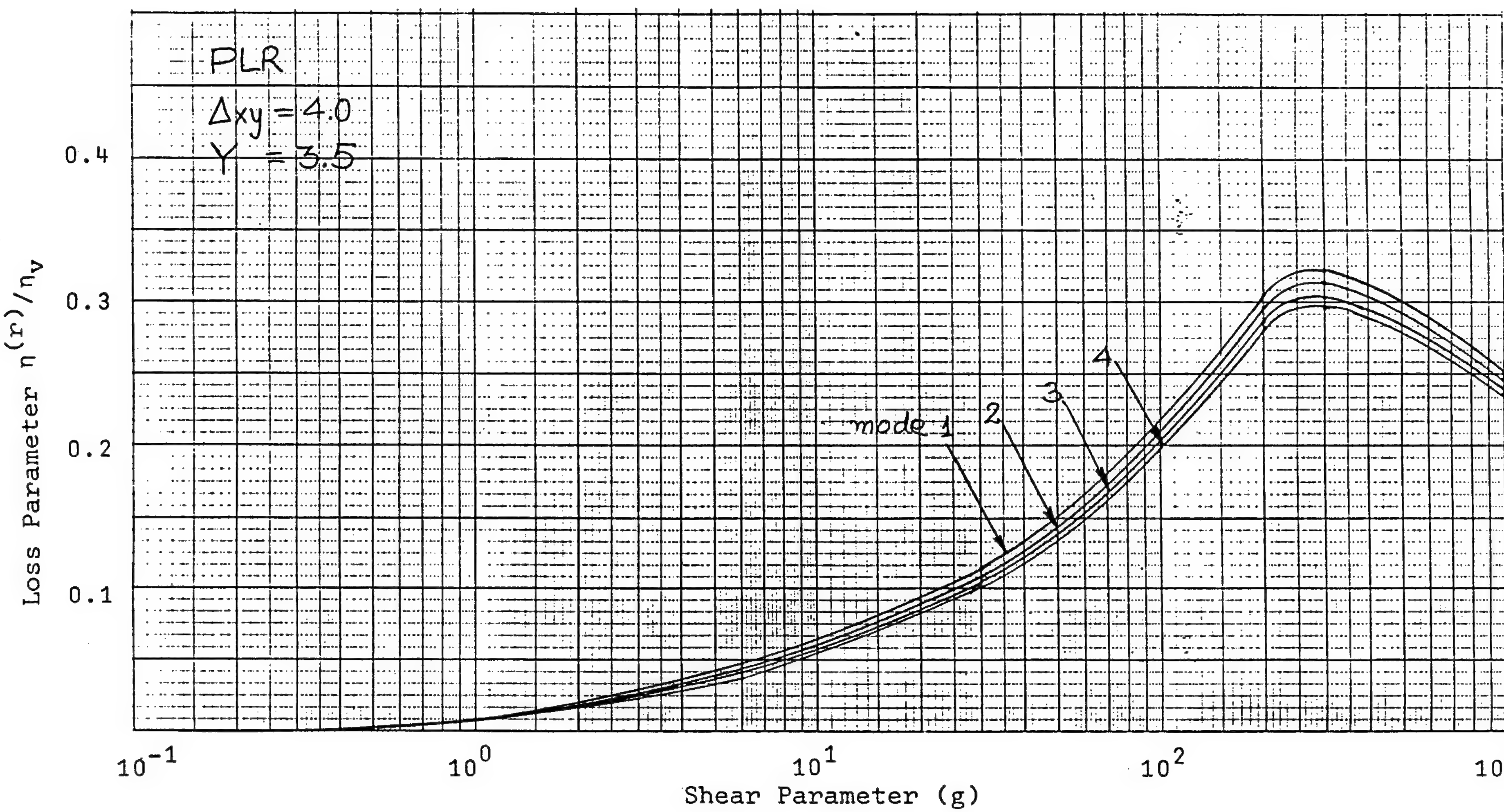

Figure 29 Damping of a sandwich rectangular plate, PLR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

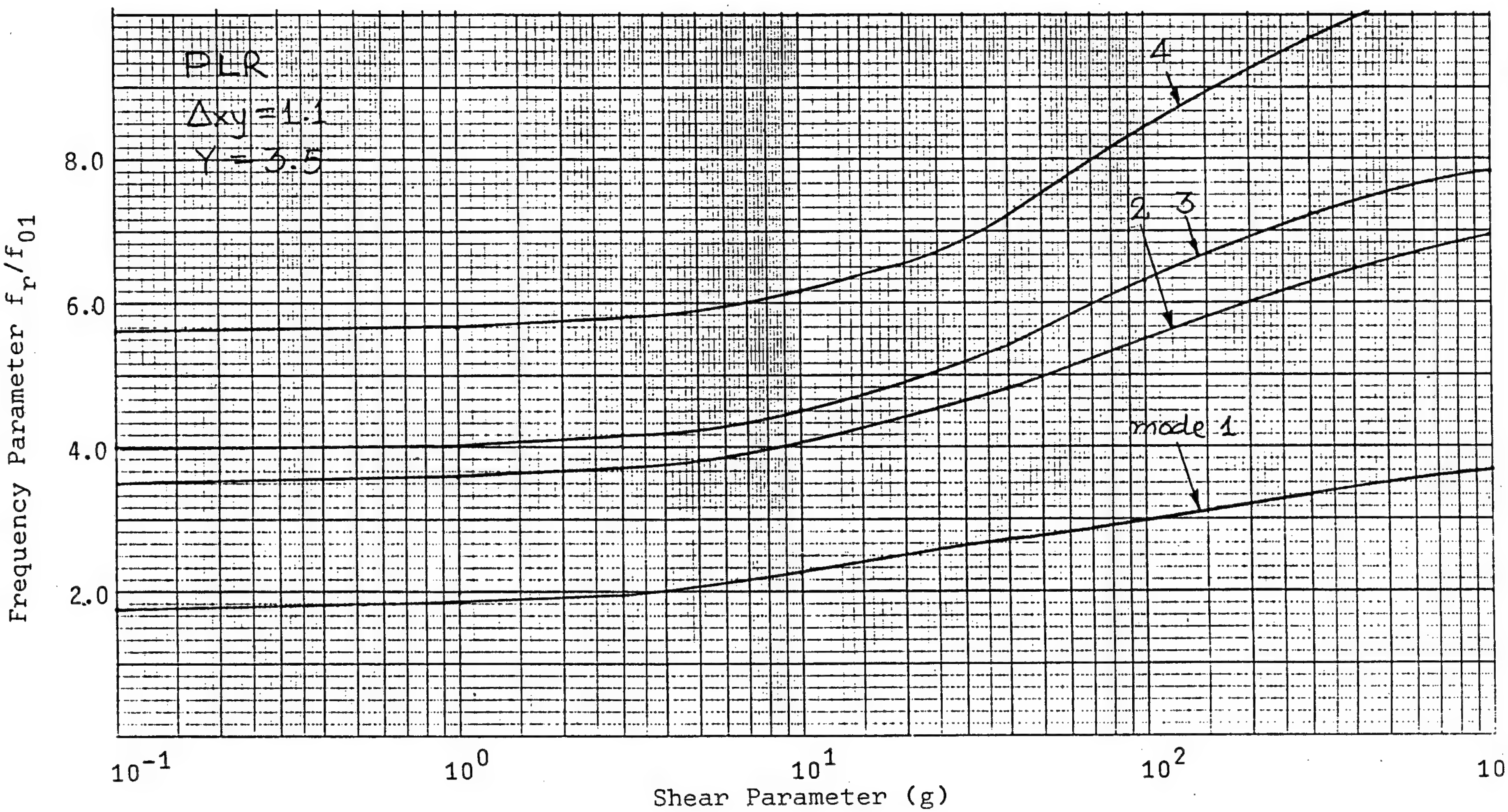

Figure 30 Natural frequencies of a rectangular sandwich plate, PLR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

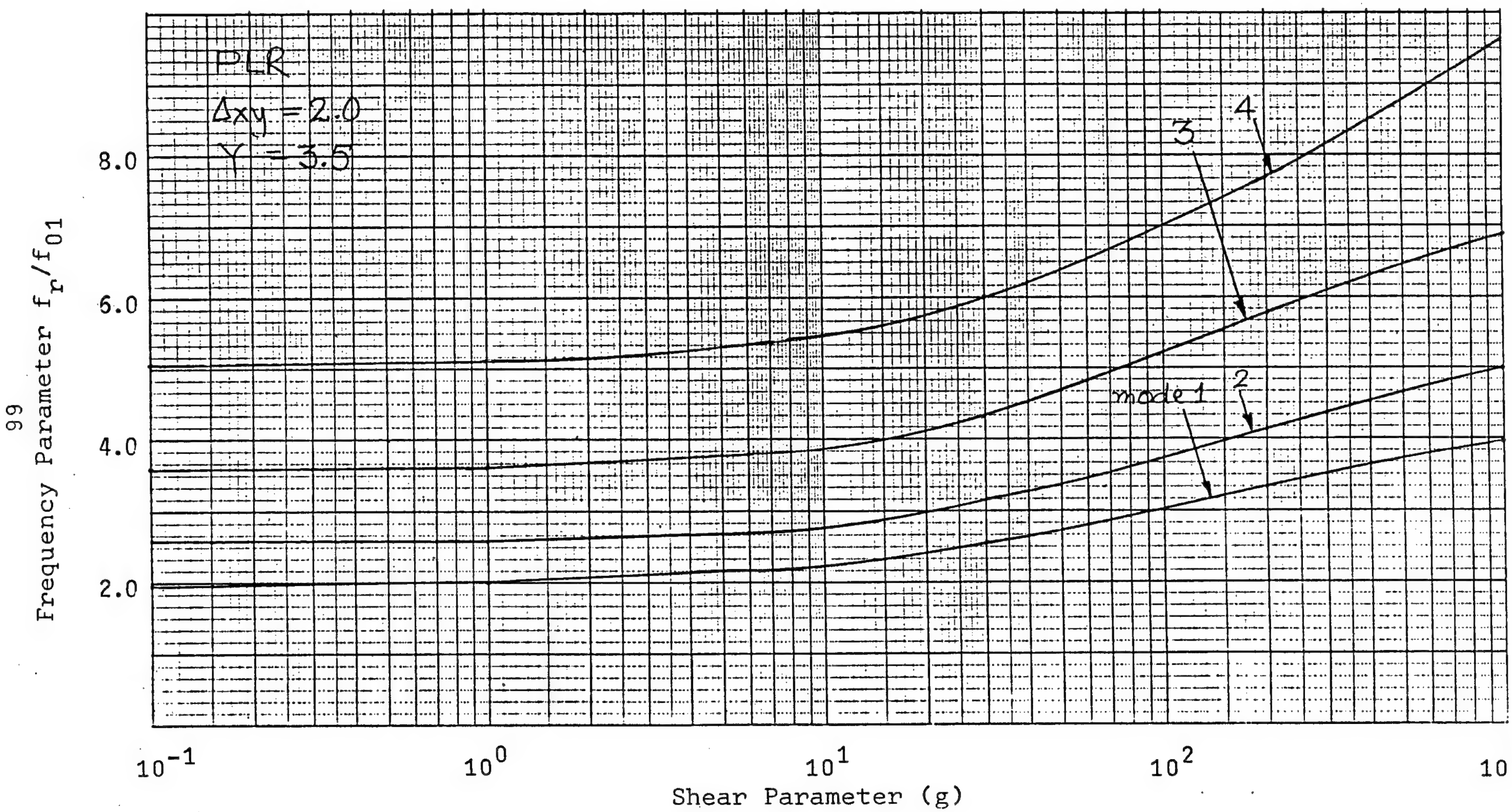

Figure 31 Natural frequencies of a rectangular sandwich plate, PLR boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

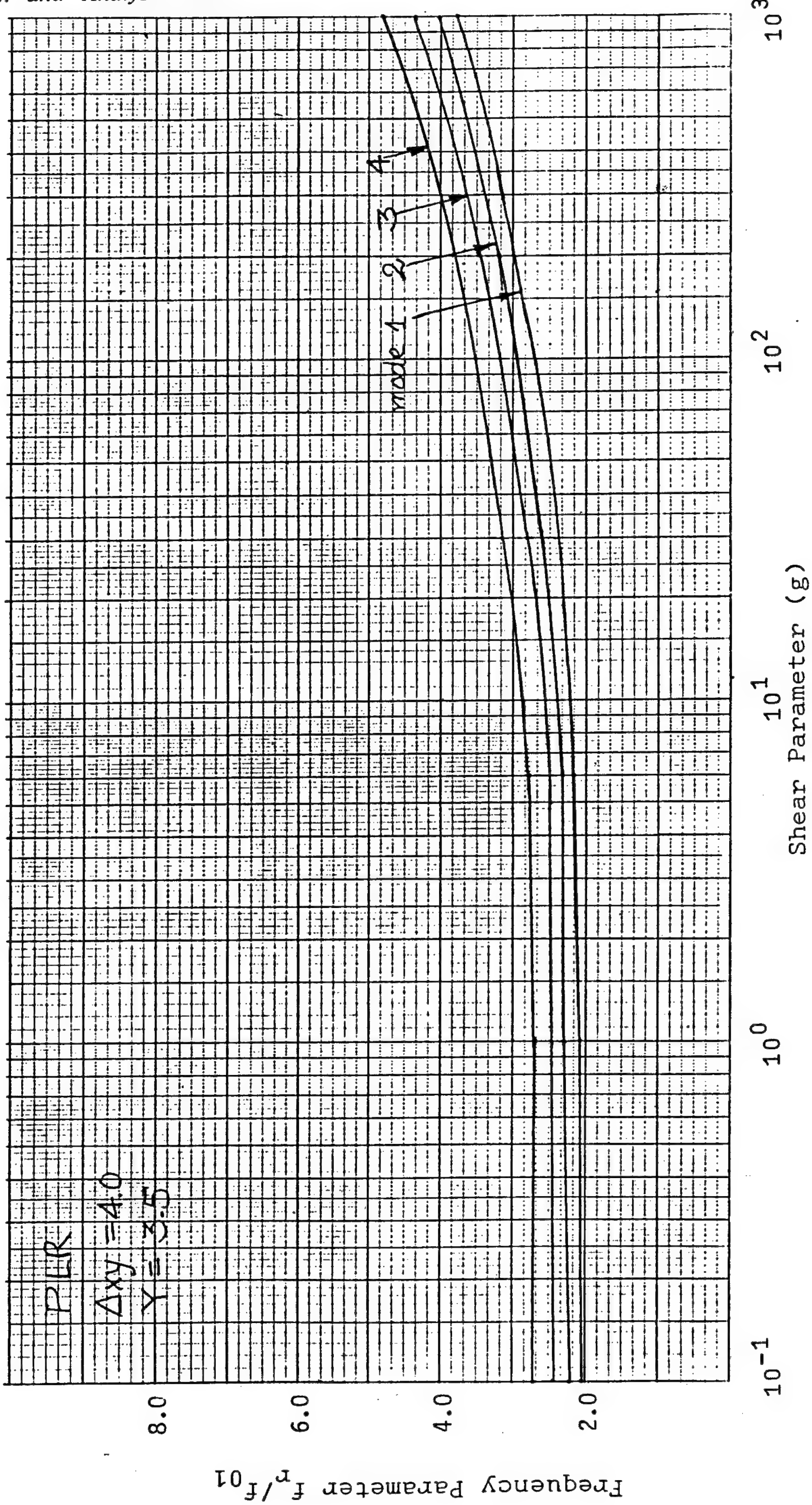

Figure 32 Natural frequencies of a rectangular sandwich plate, PLR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

TABLE 18

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PLR (zero translation, zero rotation, zero shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		10.		40.		100.		1000	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	959.	0.007	985.	0.055	1171.	0.272	259.	0.325	296.	0.248	346.	0.051
2	1852.	0.004	1884.	0.034	2130.	0.205	457.	0.316	529.	0.291	651.	0.077
3	2092.	0.003	2123.	0.03	2379.	0.192	504.	0.313	587.	0.306	735.	0.086
4	2947.	0.002	2982.	0.023	3278.	0.155	677.	0.283	792.	0.293	1004.	0.100
5	3312.	0.003	3348.	0.021	3643.	0.148	752.	0.276	868.	0.311	1126.	0.110
6	3892.	0.002	3928.	0.018	4244.	0.135	860.	0.263	997.	0.314	1315.	0.126
7	4362.	0.002	4398.	0.018	4718.	0.118	953.	0.243	1099.	0.289	1438.	0.125
8	4710.	0.002	4748.	0.015	5083.	0.111	1017.	0.236	1178.	0.287	1548.	0.133
9	5397.	0.002	5437.	0.013	5778.	0.105	1164.	0.209	1313.	0.287	1784.	0.147
10	6007.	0.001	6045.	0.012	6382.	0.092	1269.	0.205	1451.	0.271	1908.	0.152

TABLE 19

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PLR (zero translation, zero rotation, zero shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Υ) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	2369.	0.002	2395.	0.024	2529.	0.116	525.	0.269	706.	0.285	827.	0.114
2	3049.	0.002	3080.	0.022	3240.	0.107	670.	0.252	892.	0.284	1050.	0.121
3	4275.	0.002	4311.	0.018	4499.	0.089	919.	0.221	1213.	0.292	1451.	0.134
4	6099.	0.001	6140.	0.0132	6360.	0.069	1277.	0.181	1639.	0.310	2037.	0.163
5	6200.	0.001	6238.	0.012	6439.	0.065	1284.	0.159	1661.	0.302	2042.	0.188
6	6786.	0.001	6824.	0.012	7029.	0.061	1411.	0.152	1783.	0.303	2210.	0.189
7	7975.	0.001	8017.	0.010	8239.	0.053	1651.	0.136	2065.	0.292	2562.	0.187
8	8503.	0.001	8550.	0.010	8800.	0.054	1749.	0.138	2213.	0.280	2768.	0.188
9	9469.	0.001	9511.	0.009	9741.	0.046	1972.	0.119	2419.	0.275	3000.	0.197
10	11406.	0.001	11457.	0.008	11734.	0.042	2334.	0.104	2852.	0.252	3603.	0.214

TABLE 20

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PLR (zero translation, zero rotation, zero shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (γ) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)
1	8411.	0.001	8447.	0.009	8641.	0.048	1733.	0.110	2120.	0.306	2721.	0.251
2	8859.	0.001	8898.	0.009	9104.	0.048	1836.	0.110	2239.	0.298	2858.	0.247
3	9693.	0.001	9735.	0.009	9961.	0.046	2020.	0.108	2454.	0.289	3114.	0.241
4	10837.	0.001	10882.	0.008	11126.	0.045	2285.	0.105	2759.	0.284	3480.	0.241
5	12635.	0.001	12686.	0.008	12961.	0.041	2664.	0.097	3195.	0.275	4033.	0.240
6	14903.	0.001	14960.	0.007	15268.	0.037	3148.	0.086	3734.	0.263	4723.	0.244
7	17806.	0.001	17870.	0.006	18215.	0.032	3759.	0.074	4398.	0.245	5574.	0.251
8	20458.	0.001	20524.	0.005	20886.	0.031	4427.	0.064	5083.	0.233	6396.	0.264
9	22487.	0.000	22554.	0.004	22920.	0.025	4961.	0.045	5524.	0.181	6854.	0.266
10	23007.	0.000	23074.	0.004	23433.	0.023	5094.	0.043	5663.	0.174	6999.	0.259

3.2.3 <u>PTR Boundary Conditions</u>

Damping properties of sandwich plates with PTR (simply-supported, riveted) boundary conditions are given in Figures 33 through 35. Again, only a single value of the geometry parameter, Y = 3.5, is considered.

Natural frequencies of sandwich plates with PTR boundary conditions are given in Figures 36 through 38. Reference frequencies are given in Table 5.

A tabular presentation of the data for damping and natural frequencies of plates with PTR boundary conditions is given in Tables 21 through 23.

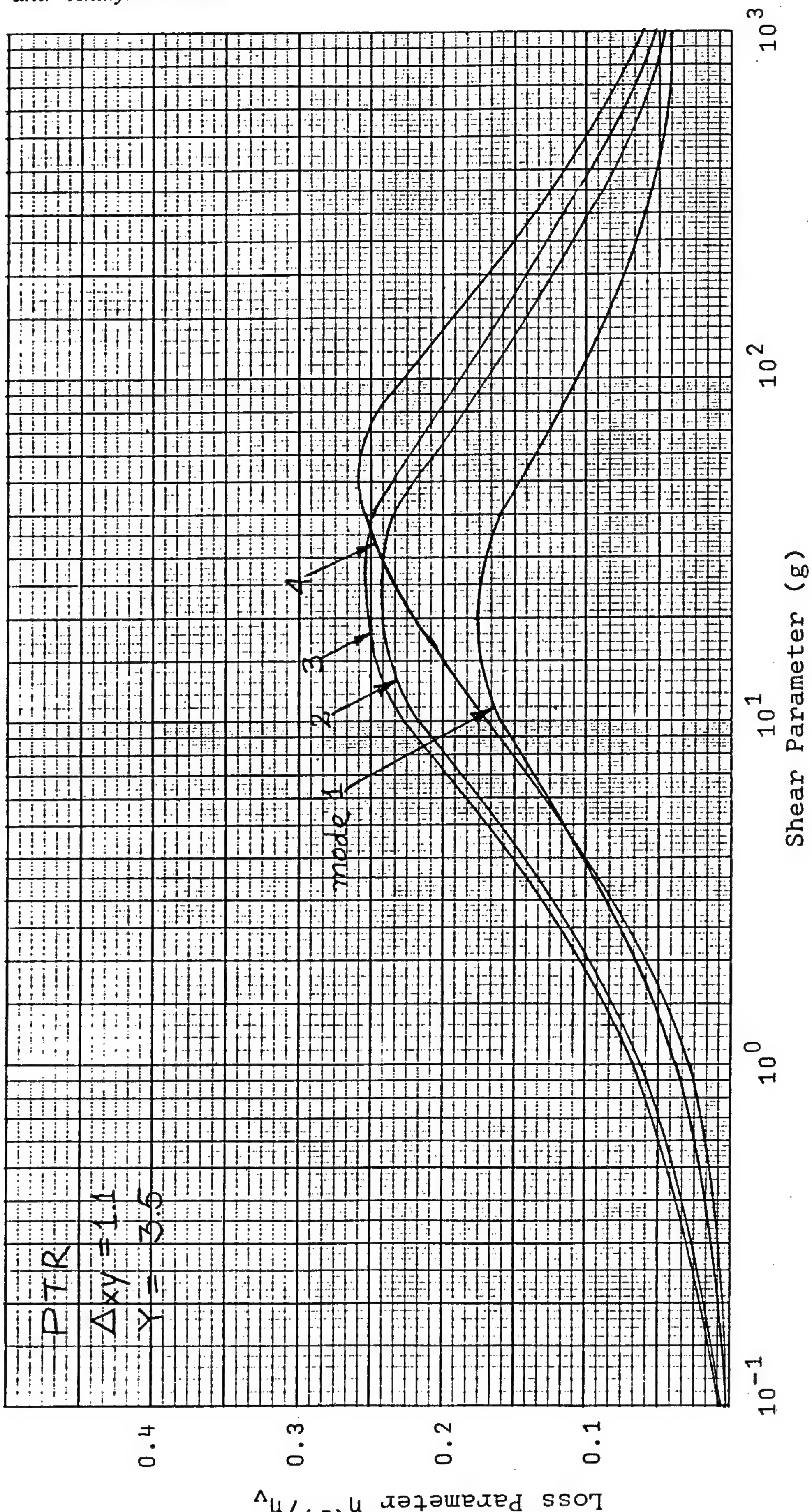

Figure 33 Damping of a sandwich rectangular plate, PTR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

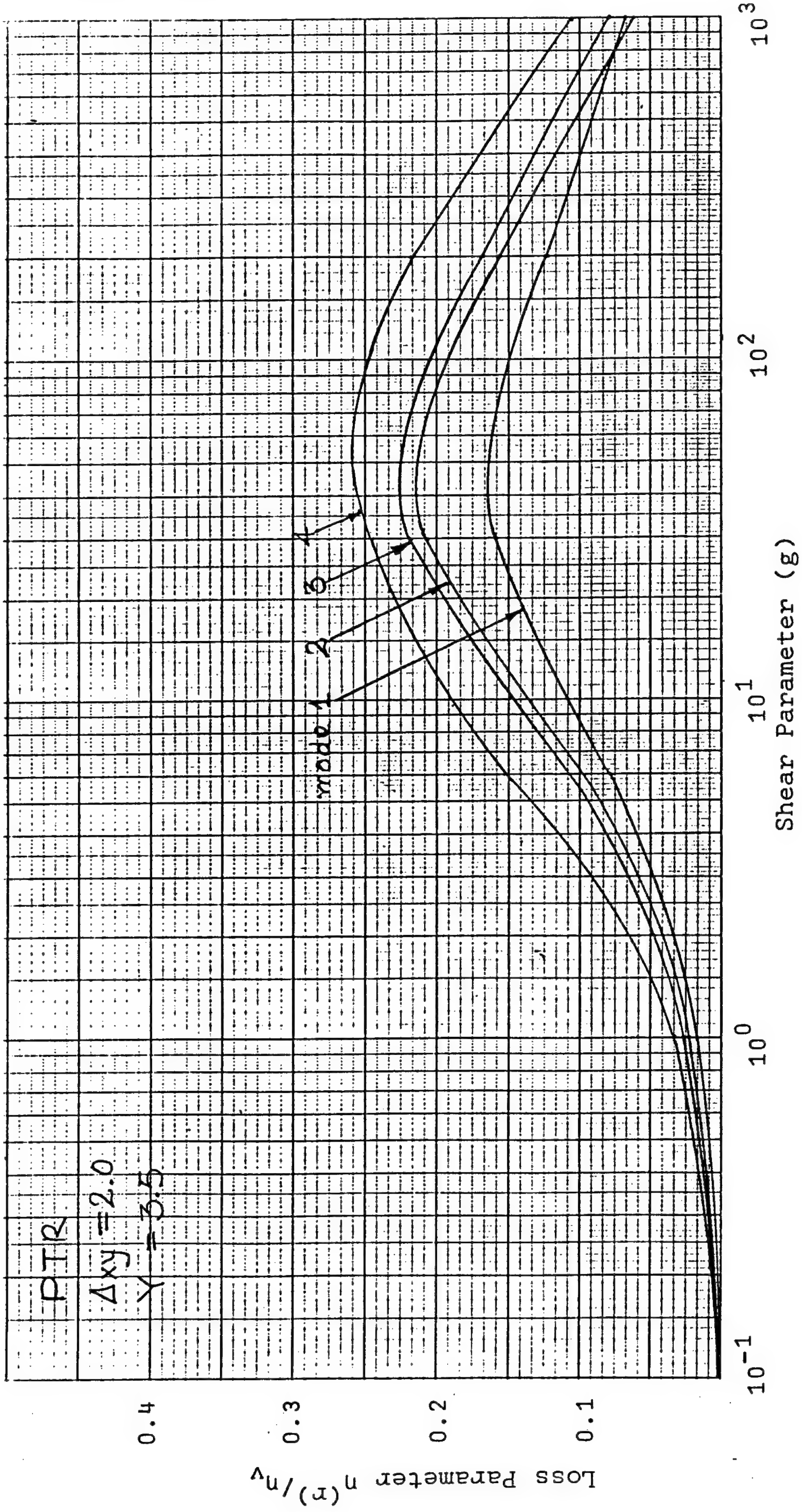

Figure 34 Damping of a sandwich rectangular plate, PTR boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

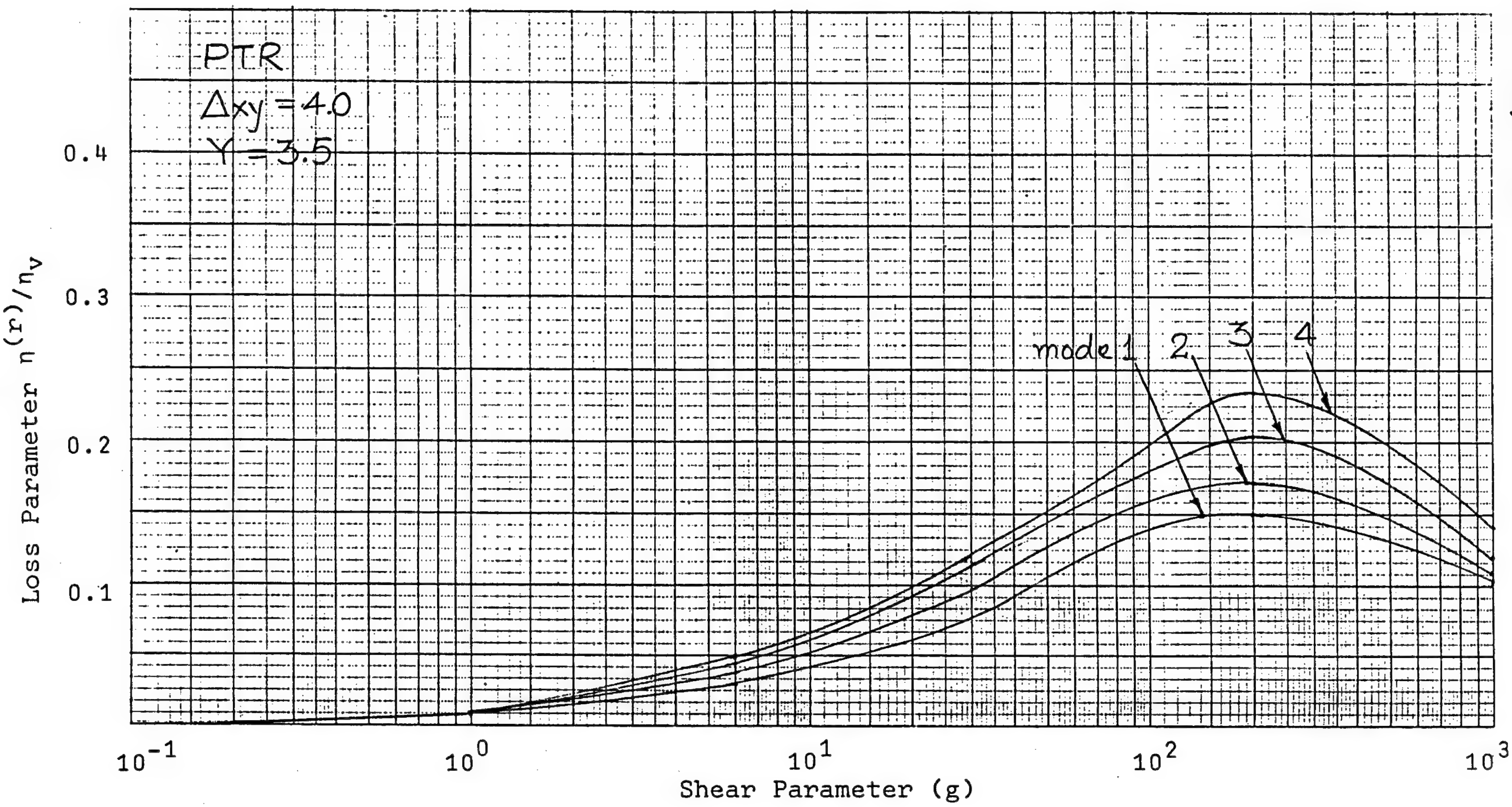

Figure 35 Damping of a sandwich rectangular plate, PTR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

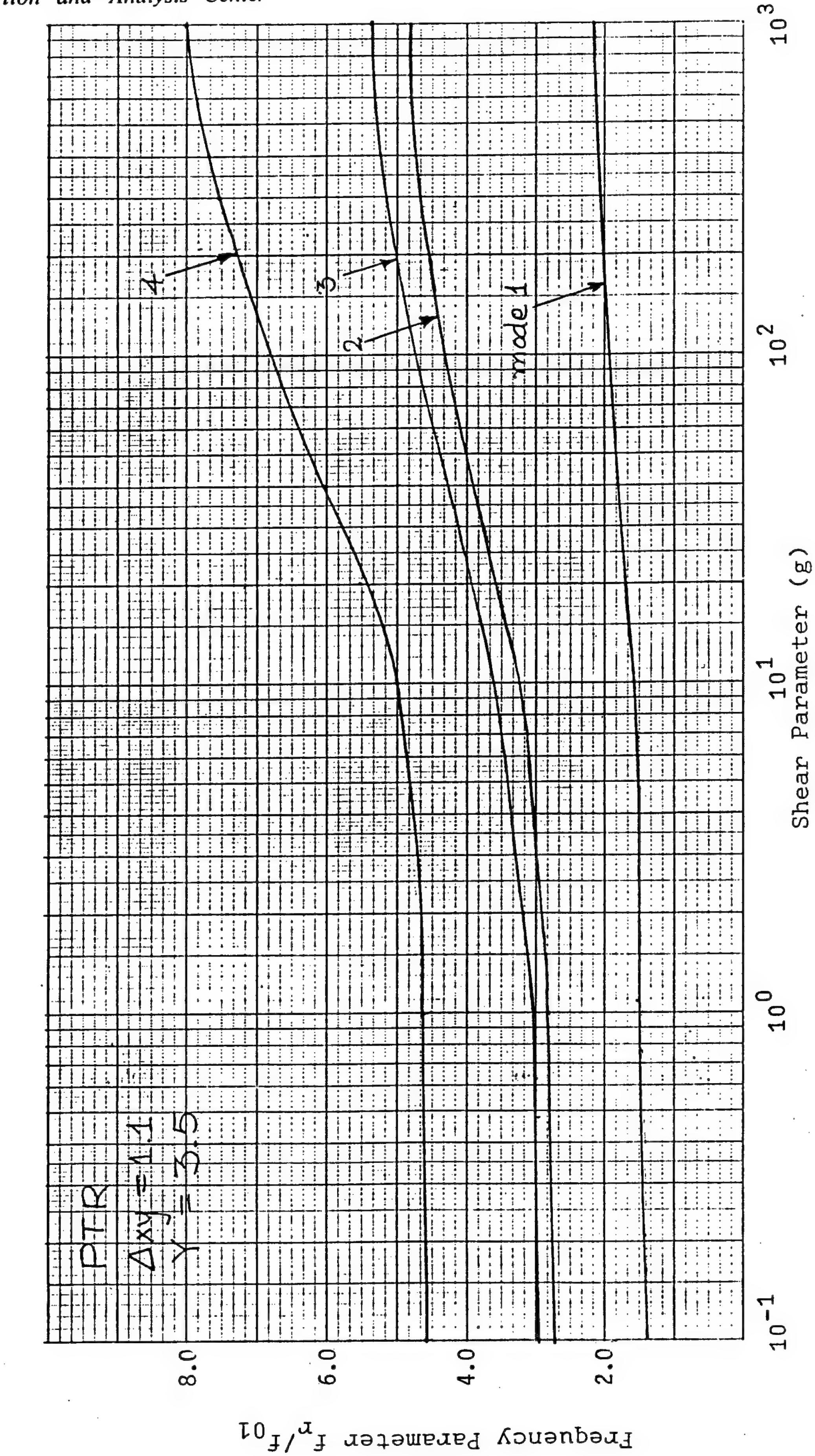

Figure 36 Natural frequencies of a rectangular sandwich plate, PTR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

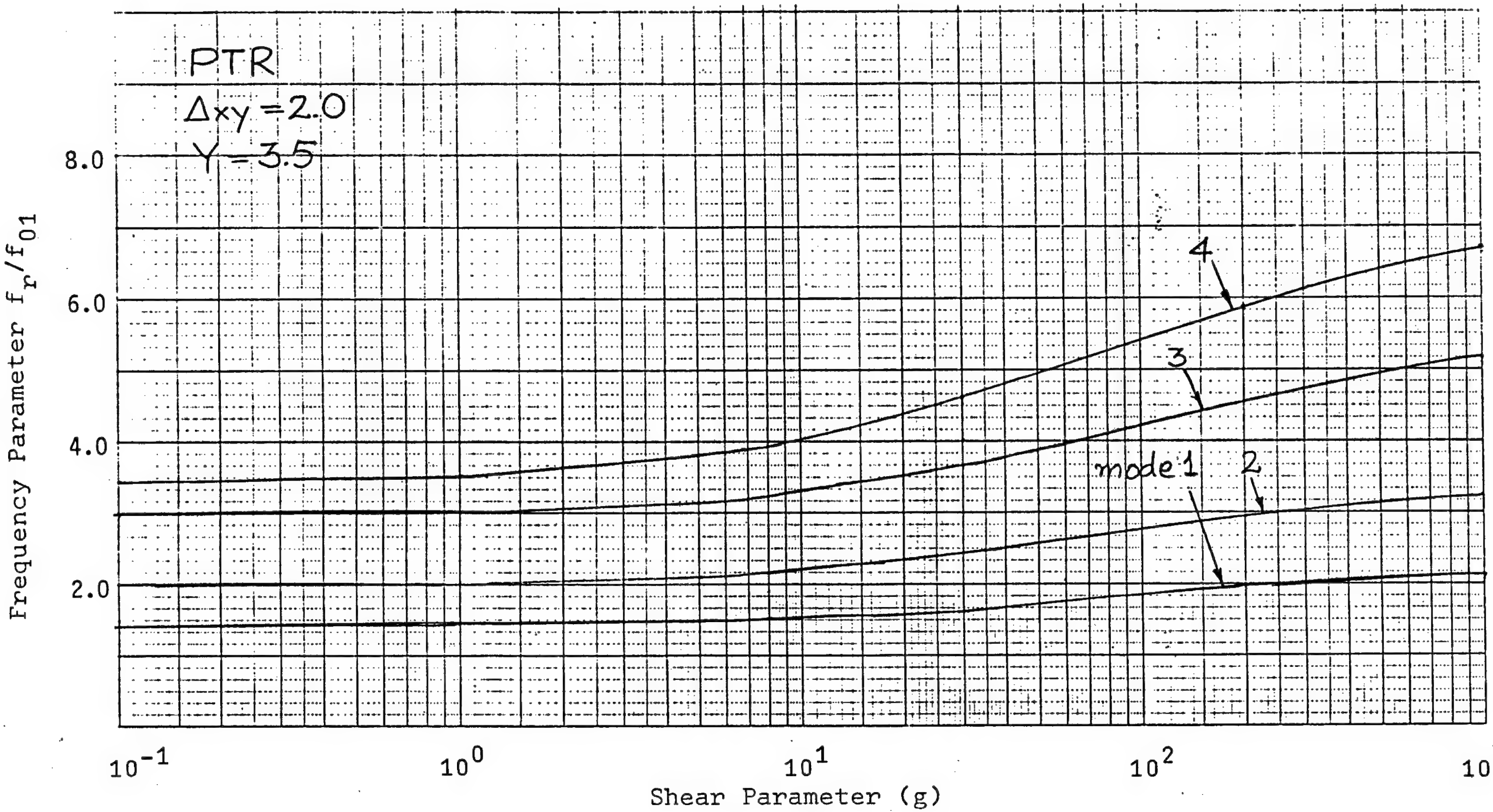

Figure 37 Natural frequencies of a rectangular sandwich plate, PTR boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

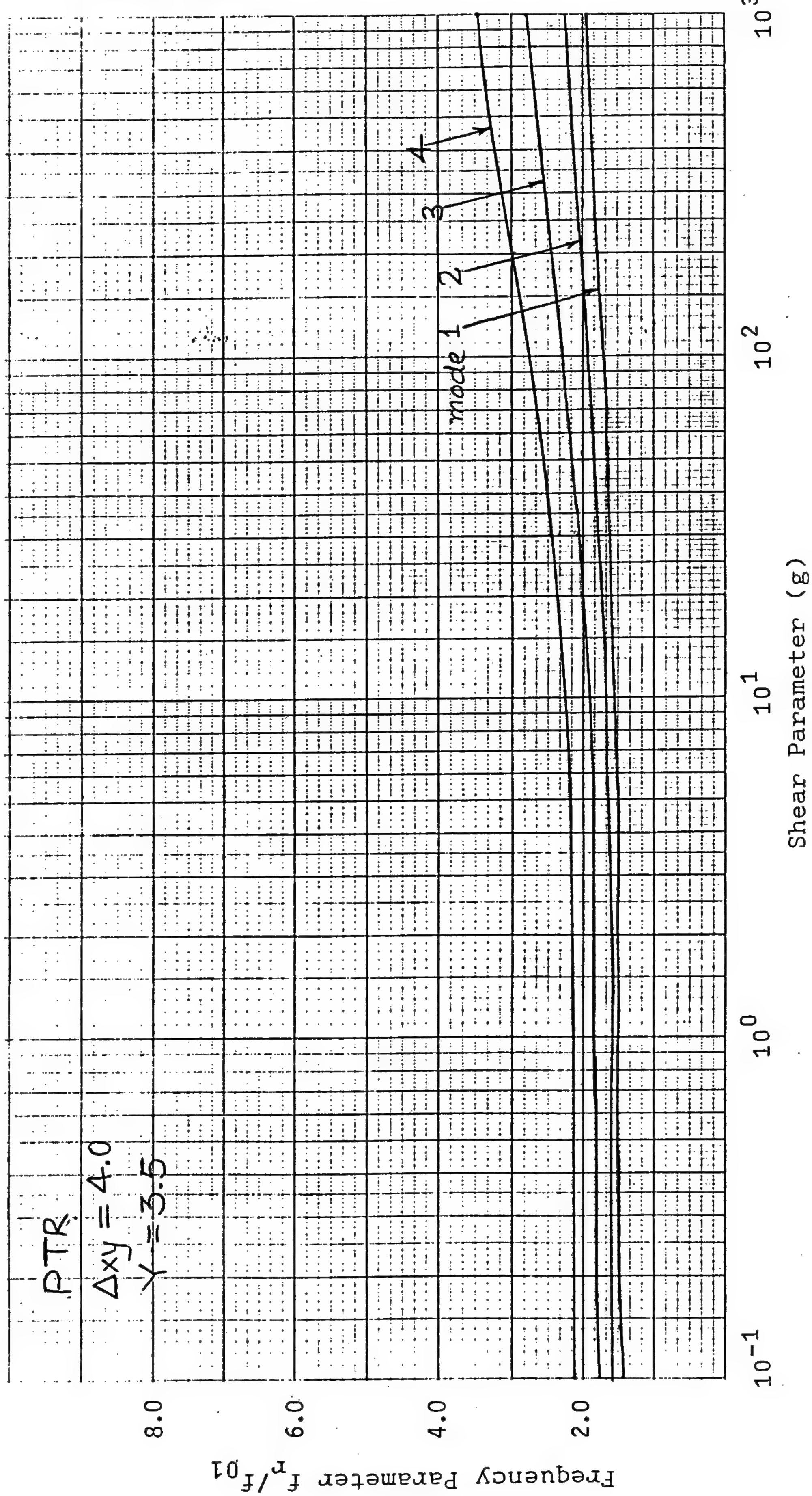

Figure 38 Natural frequencies of a rectangular sandwich plate, PTR boundary conditions, $\Delta xy = 4.0$, $\gamma = 3.5$

TABLE 21

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTR (zero translation, unrestrained rotation, zero shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Υ) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		10.		40.		300.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	751.	0.004	764.	0.037	854.	0.161	172.	0.161	192.	0.06	197.	0.043
2	1443.	0.007	1486.	0.059	1743.	0.217	367.	0.236	436.	0.093	454.	0.039
3	1548.	0.007	1579.	0.062	1890.	0.227	400.	0.249	485.	0.111	510.	0.056
4	2409.	0.003	2444.	0.030	2719.	0.171	568.	0.249	709.	0.133	752.	0.060
5	2719.	0.003	2762.	0.032	3091.	0.181	648.	0.266	821.	0.150	876.	0.063
6	3113.	0.003	3154.	0.027	3492.	0.170	729.	0.268	940.	0.172	1016.	0.083
7	3669.	0.002	3707.	0.021	4024.	0.137	830.	0.240	1065.	0.175	1151.	0.080
8	3888.	0.002	3928.	0.020	4265.	0.137	880.	0.242	1137.	0.185	1238.	0.090
9	4372.	0.004	4449.	0.032	4969.	0.152	1026.	0.237	1344.	0.196	1475.	0.096
10	5054.	0.003	5139.	0.029	5474.	0.110	1119.	0.216	1443.	0.216	1592.	0.110

TABLE 22

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTR (zero translation, unrestrained rotation, zero shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Υ) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)
1	1707.	0.002	1721.	0.018	1789.	0.079	353.	0.160	410.	0.123	441.	0.068
2	2374.	0.003	2401.	0.024	2532.	0.106	519.	0.207	629.	0.157	685.	0.064
3	3541.	0.002	3576.	0.021	3752.	0.098	772.	0.218	973.	0.204	1091.	0.078
4	4117.	0.004	4198.	0.039	4571.	0.153	984.	0.244	1248.	0.218	1427.	0.105
5	5092.	0.002	5146.	0.021	5415.	0.098	1113.	0.200	1416.	0.233	1633.	0.114
6	5162.	0.002	5210.	0.018	5449.	0.086	1126.	0.204	1425.	0.248	1655.	0.108
7	6464.	0.001	6509.	0.013	6738.	0.067	1370.	0.167	1709.	0.239	2000.	0.122
8	7323.	0.001	7376.	0.014	7653.	0.068	1548.	0.168	1966.	0.266	2356.	0.137
9	8075.	0.001	8117.	0.010	8341.	0.053	1690.	0.140	2081.	0.254	2475.	0.144
10	9642.	0.002	9695.	0.011	10003.	0.057	2015.	0.148	2495.	0.255	3005.	0.164

TABLE 23

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTR (zero translation, unrestrained rotation, zero shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	5920.	0.001	5935.	0.006	6020.	0.030	1143.	0.072	1279.	0.148	1428.	0.106
2	6415.	0.001	6440.	0.007	6557.	0.038	1272.	0.097	1462.	0.171	1650.	0.110
3	7335.	0.001	7364.	0.008	7522.	0.043	1488.	0.115	1756.	0.202	2018.	0.121
4	8640.	0.001	8676.	0.009	8871.	0.047	1787.	0.120	2142.	0.234	2516.	0.143
5	10500.	0.001	10543.	0.008	10781.	0.044	2184.	0.114	2633.	0.250	3163.	0.164
6	12783.	0.001	12840.	0.008	12634.	0.040	2673.	0.103	3206.	0.256	3925.	0.187
7	13740.	0.002	13880.	0.160	14582.	0.080	3266.	0.089	3874.	0.250	4804.	0.211
8	14863.	0.001	14983.	0.130	15612.	0.066	3298.	0.188	4138.	0.250	4999.	0.180
9	15560.	0.001	15620.	0.007	15950.	0.036	3481.	0.155	4284.	0.236	5174.	0.179
10	16520.	0.001	16620.	0.010	17153.	0.053	3762.	0.124	4519.	0.231	5458.	0.188

3.2.4 PWU Boundary Conditions

A situation that might lead to PWU or PWR boundary conditions is shown in Figure 39. A structure is fabricated by butt welding of plate sections that contain an integral damping treatment. One leg of the weldment sees a constraint on shearing of the sandwich core (PWR), while the other [PWU] does not. Both see some restraint on bending rotation at the welded boundary but it is not held exactly to zero. The restraint is approximated as a pure stiffness and is evaluated, somewhat arbitrarily, as follows. The degree of elastic restraint is taken to be equal to the rotational stiffness of the hypothetical plate used to calculate the reference frequencies. The hypothetical plate has the dimensions of the actual plate but with a flexural stiffness $(EI)_{eqv}$ equal to the sum of the flexural stiffnesses of the upper and lower face sheets. The rotational stiffness at the edge of the hypothetical plate is calculated for that edge unrestrained and a clamped condition imposed on the opposite edge.

Damping as a function of the shear parameter for the first four modes of a rectangular sandwich plate with PWU boundary conditions and a geometry parameter of $Y = 3.5$ is shown in Figures 40 through 42.

Natural frequencies for sandwich plates with PWU boundary conditions are given in Figures 43 through 45. Reference frequencies are given in Table 5.

A tabular presentation of the data in Figures 40 through 45 is given in Tables 24 through 26, as well as results for the fifth and higher modes.

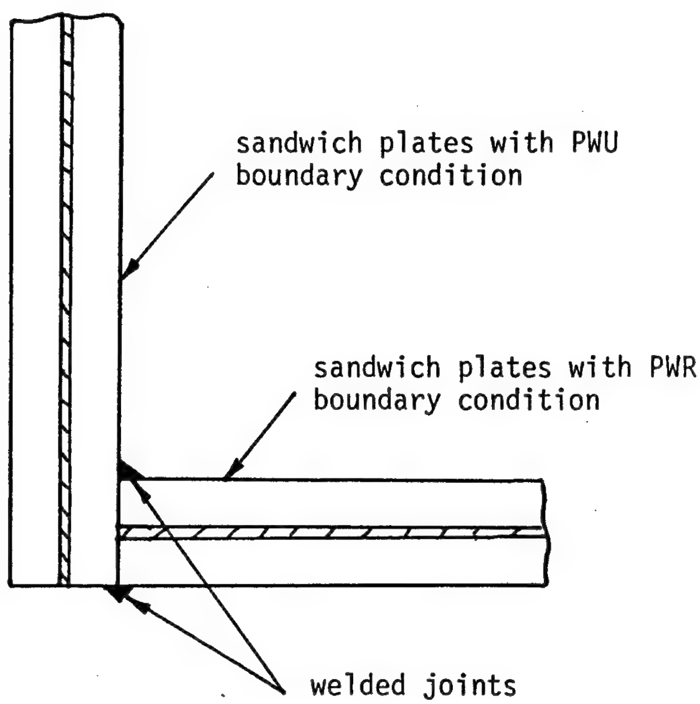

Figure 39 Sandwich plates with PWU and PWR boundary conditions

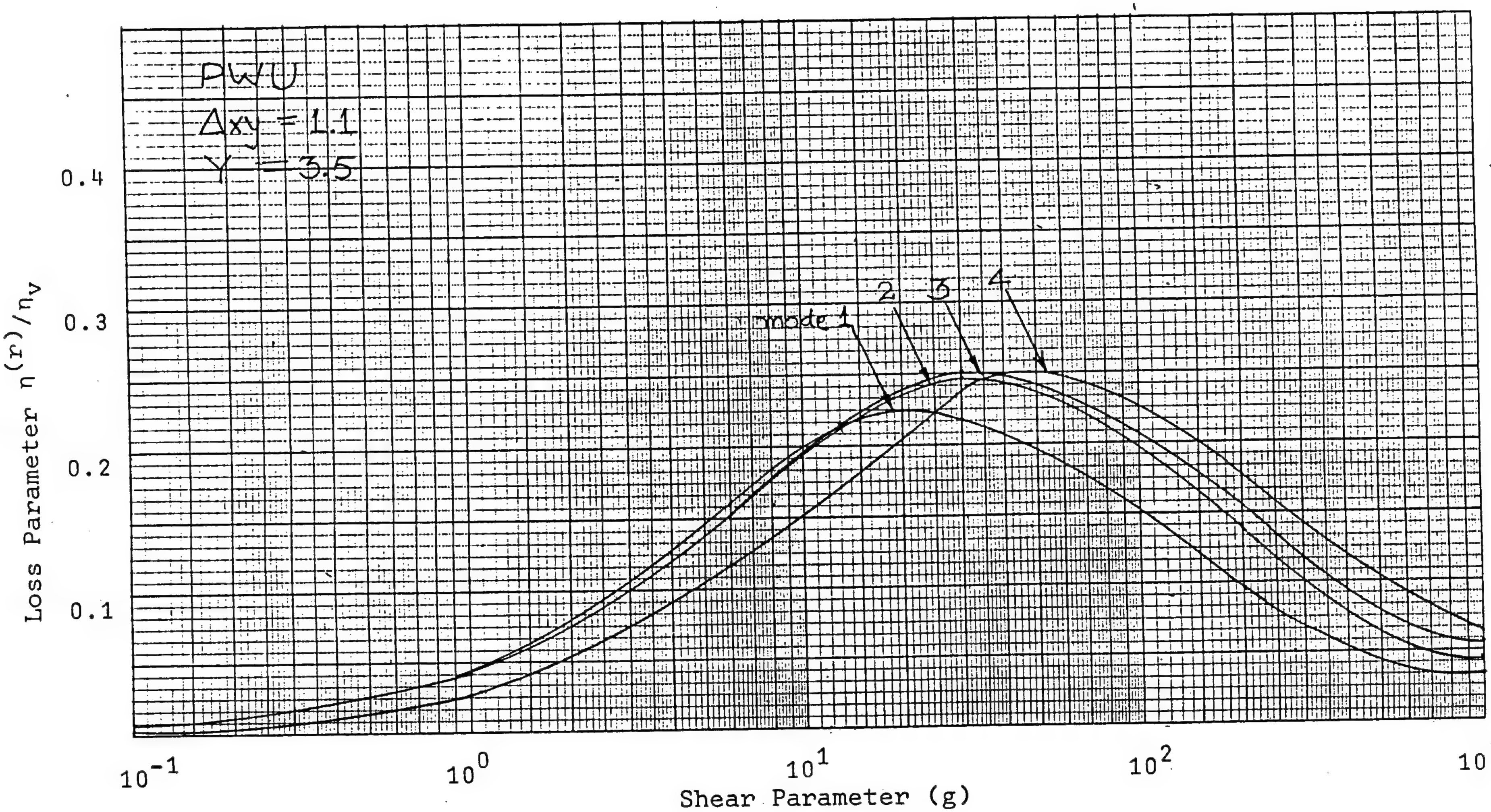

Figure 40 Damping of a sandwich rectangular plate, PWU boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

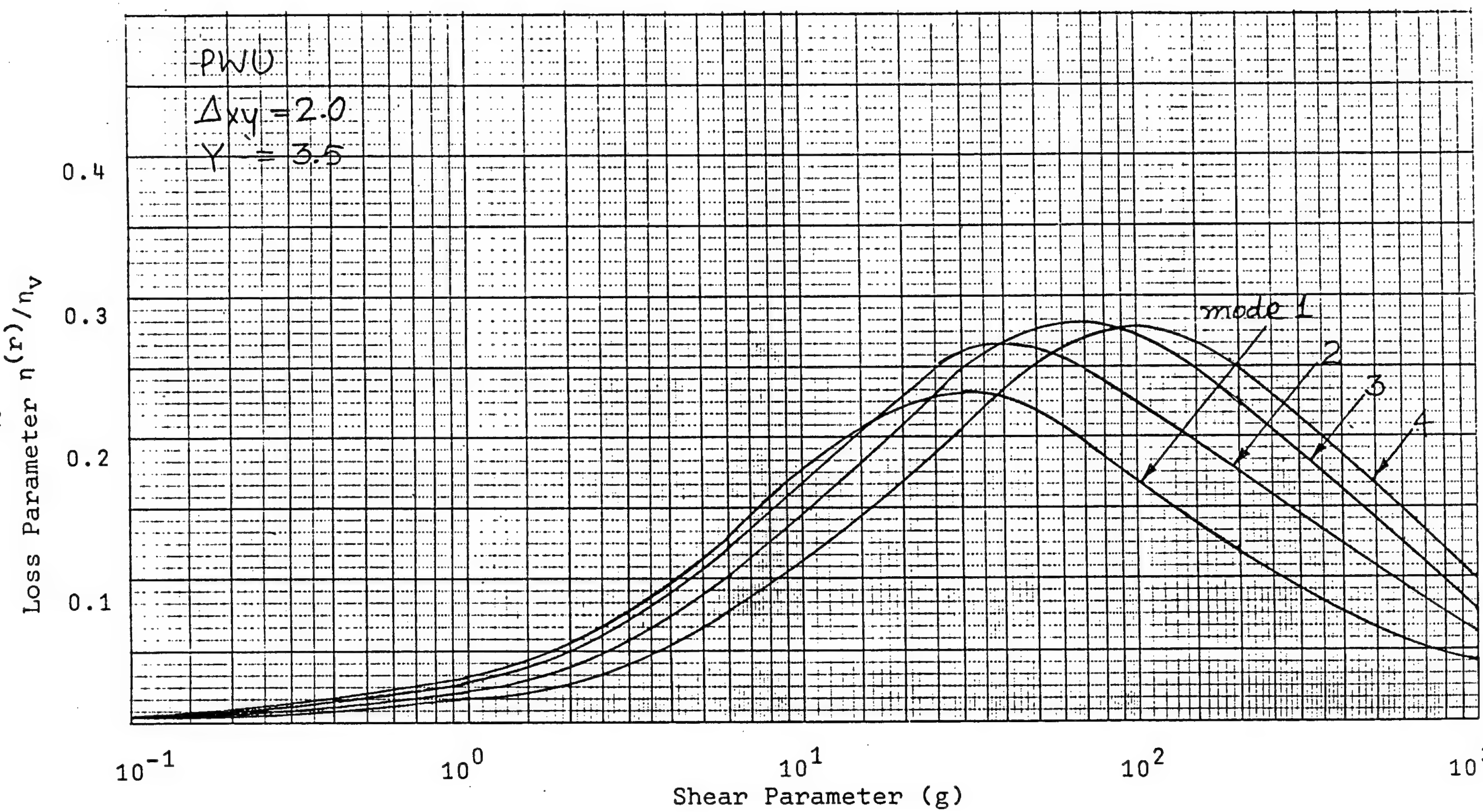

Figure 41 Damping of a sandwich rectangular plate, PWU boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

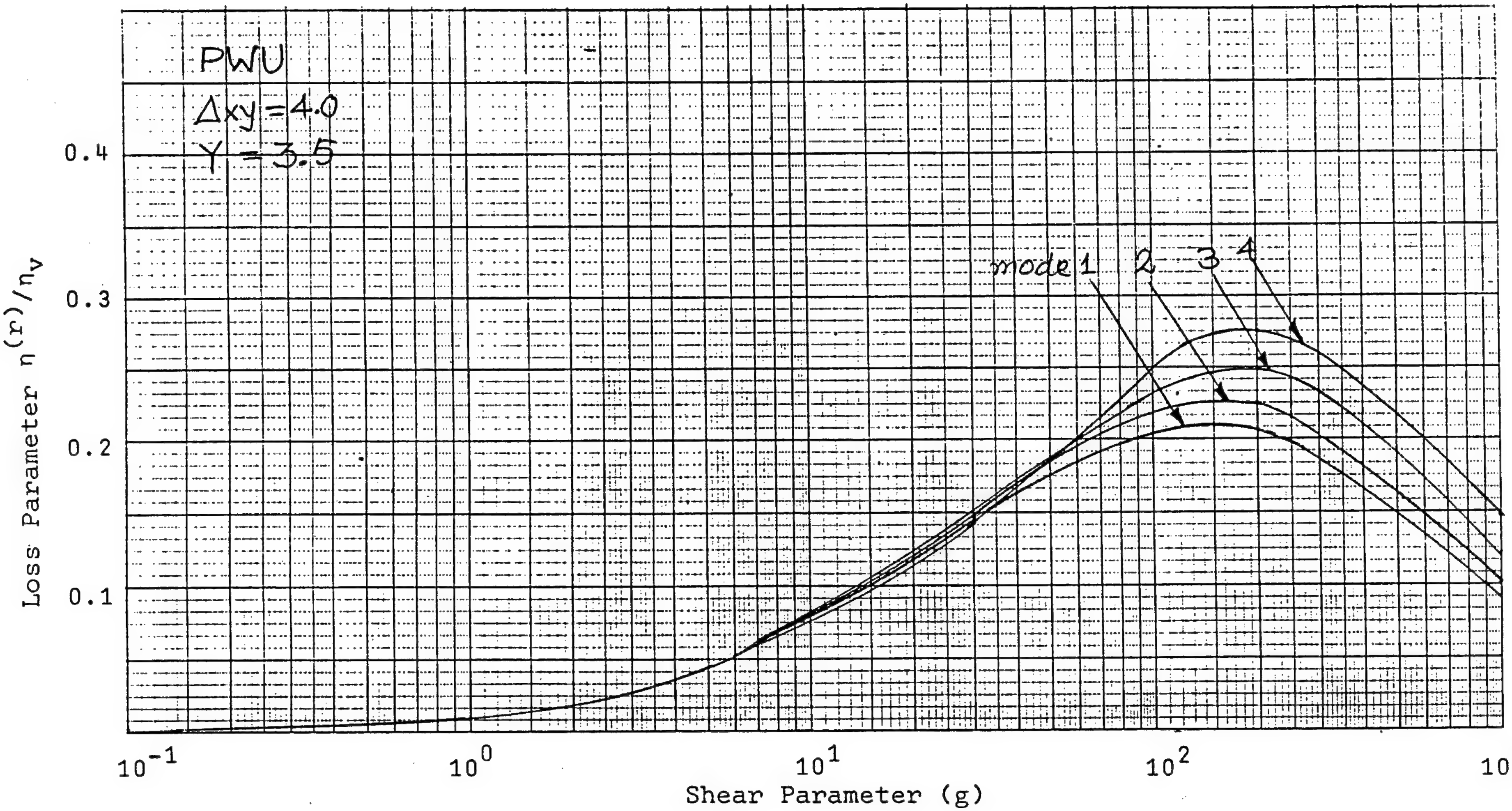

Figure 42 Damping of a sandwich rectangular plate, PWU boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

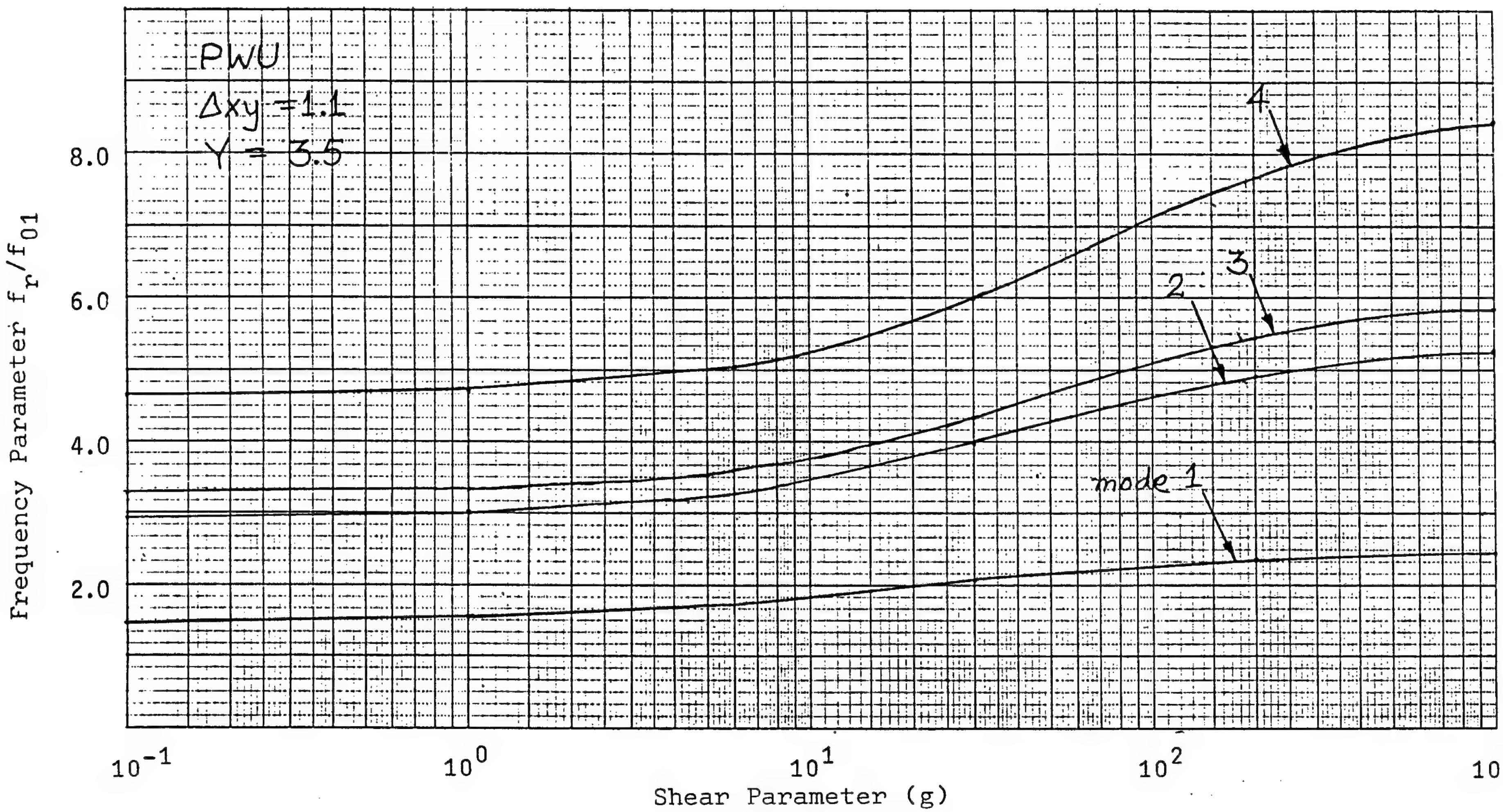

Figure 43 Natural frequencies of a rectangular sandwich plate, PWU boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

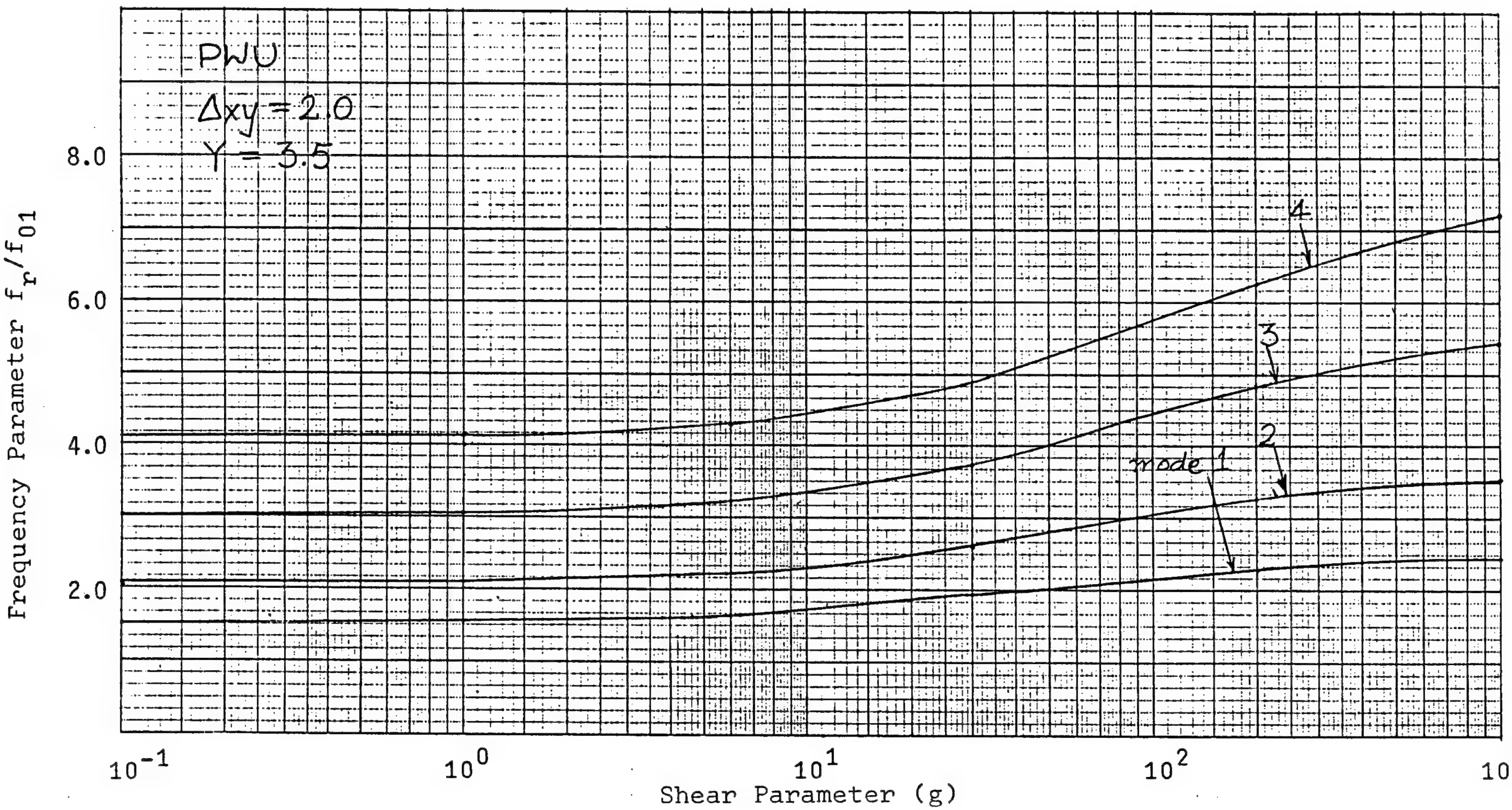

Figure 44 Natural frequencies of a rectangular sandwich plate, PWU boundary conditions, Δxy = 2.0, Y = 3.5

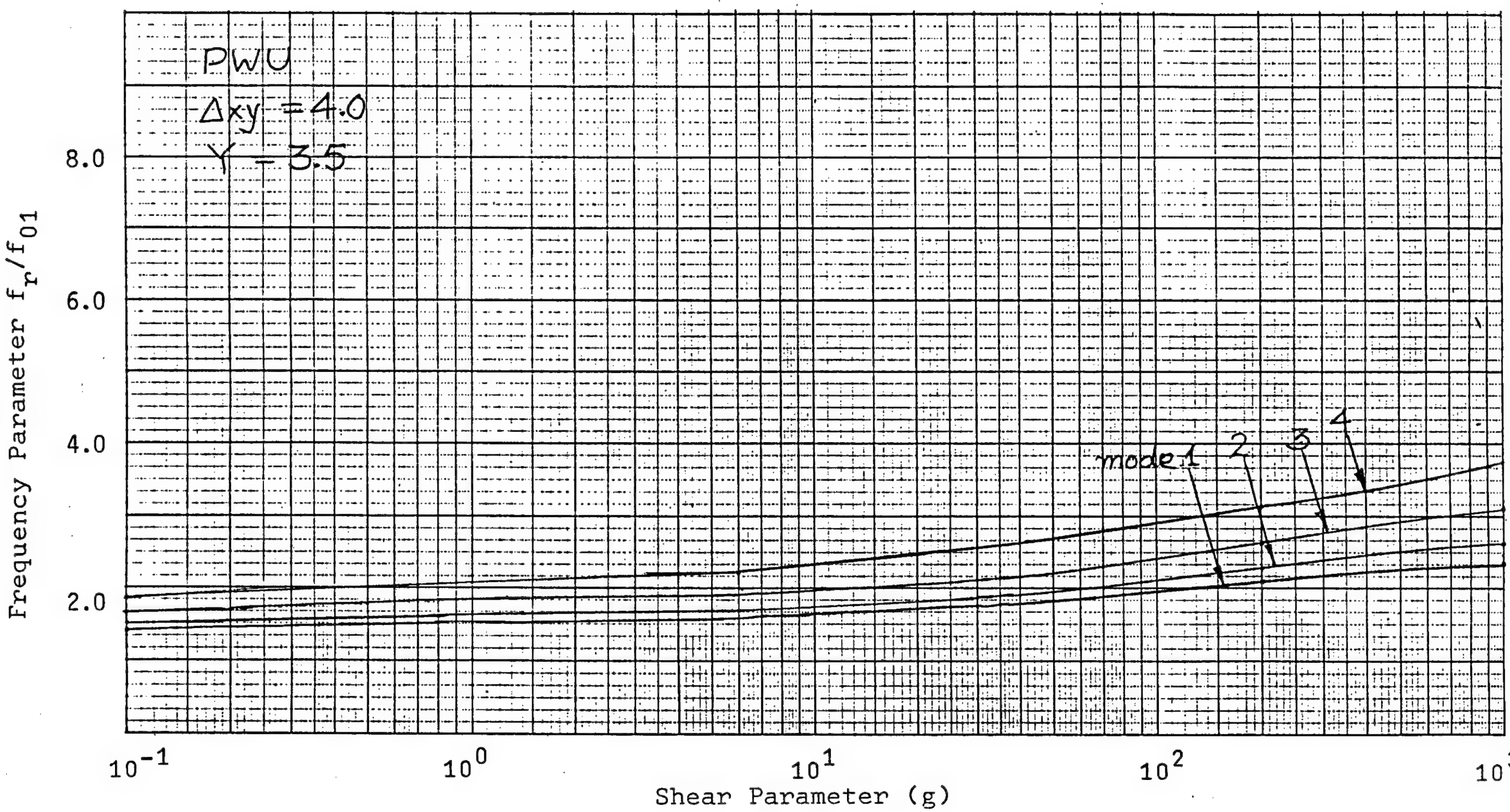

Figure 45 Natural frequencies of a rectangular sandwich plate, PWU boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

TABLE 24

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PWU (zero translation, elastically restrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)
1	780.	0.008	805.	0.066	907.	0.207	195.	0.215	222.	0.075	231.	0.026
2	1552.	0.004	1583.	0.041	1728.	0.170	374.	0.280	462.	0.134	492.	0.038
3	1719.	0.004	1751.	0.038	1902.	0.162	409.	0.283	511.	0.145	548.	0.041
4	2452.	0.003	2486.	0.028	2654.	0.130	562.	0.274	723.	0.184	794	0.056
5	2815.	0.003	2850.	0.025	3024.	0.121	633.	0.270	824.	0.210	917.	0.067
6	3238.	0.002	3274	0.023	3458.	0.111	718.	0.261	941.	0.228	1061.	0.076
7	3679.	0.002	3715.	0.020	3899.	0.097	805.	0.242	1052.	0.235	1195.	0.083
8	3940.	0.002	3977.	0.019	4167.	0.093	856.	0.237	1122.	0.244	1284.	0.089
9	4657.	0.002	4697.	0.016	4900.	0.082	991.	0.211	1304.	0.257	1518.	0.106
10	5077.	0.001	5114.	0.015	5308.	0.076	1080.	0.206	1400.	0.270	1638.	0.112

TABLE 25

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PWU (zero translation, elastically restrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Υ) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)
1	1801.	0.003	1827.	0.031	1952.	0.132	407.	0.230	487.	0.123	518.	0.042
2	2446.	0.003	2477.	0.027	2631.	0.123	552.	0.257	694.	0.172	755.	0.055
3	3591.	0.002	3628.	0.021	3809.	0.102	789.	0.246	1024.	0.228	1156.	0.078
4	4904.	0.002	4941.	0.015	5133.	0.078	1036.	0.204	1329.	0.249	1531.	0.099
5	5260.	0.002	5301.	0.015	5513.	0.079	1117.	0.209	1461.	0.273	1716.	0.114
6	5495.	0.002	5532.	0.014	5729.	0.073	1158.	0.326	1483.	0.317	1729.	0.401
7	6604.	0.001	6643.	0.012	6856.	0.063	1379.	0.346	1761.	0.319	2090.	0.401
8	7447.	0.001	7493.	0.012	7732.	0.061	1543.	0.369	1985.	0.323	2413.	0.402
9	8072.	0.001	8113.	0.010	8336.	0.054	1678.	0.371	2113.	0.323	2554.	0.398
10	10072.	0.001	10084.	0.001	10340.	0.047	2041.	0.362	2531.	0.308	3118.	0.376

TABLE 26

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PWU (zero translation, elastically restrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	5643.	0.002	6094.	0.011	6258.	0.055	1245.	0.148	1506.	0.204	1701.	0.092
2	6062.	0.001	6587.	0.011	6765.	0.055	1354.	0.151	1658.	0.225	1899.	0.103
3	6553.	0.001	7480.	0.010	7679.	0.054	1544.	0.150	1911.	0.250	2236.	0.122
4	7442.	0.001	8757.	0.010	8979.	0.052	1817.	0.142	2255.	0.275	2700.	0.148
5	8715.	0.001	10604.	0.009	1086.	0.047	2192	0.127	2709.	0.285	3320.	0.175
6	10556.	0.001	12895.	0.008	13184.	0.042	2664.	0.110	3251.	0.283	4055.	0.201
7	12841.	0.001	15690.	0.007	16016.	0.037	3244.	0.093	3892.	0.272	4912.	0.225
8	15629.	0.001	17662.	0.006	17990.	0.031	3641.	0.076	4254.	0.241	5277.	0.217
9	17600.	0.001	18219.	0.005	18575.	0.032	3762.	0.073	4384.	0.235	5440.	0.217
10	18156.	0.001	18474.	0.006	18826.	0.034	3894.	0.078	4570.	0.261	5702.	0.224

3.2.5 PWR Boundary Conditions

Damping as a function of the shear parameter for the first four modes of a rectangular sandwich plate with PWR boundary conditions and a geometry parameter of $Y = 3.5$ is shown in Figures 46 through 48.

Natural frequencies for sandwich plates with PWR boundary conditions are shown in Figures 49 through 51. Reference frequencies are given in Table 5.

A tabular presentation of the data in Figures 46 through 51 is given in Tables 27 through 29, as well as results for the fifth and higher modes.

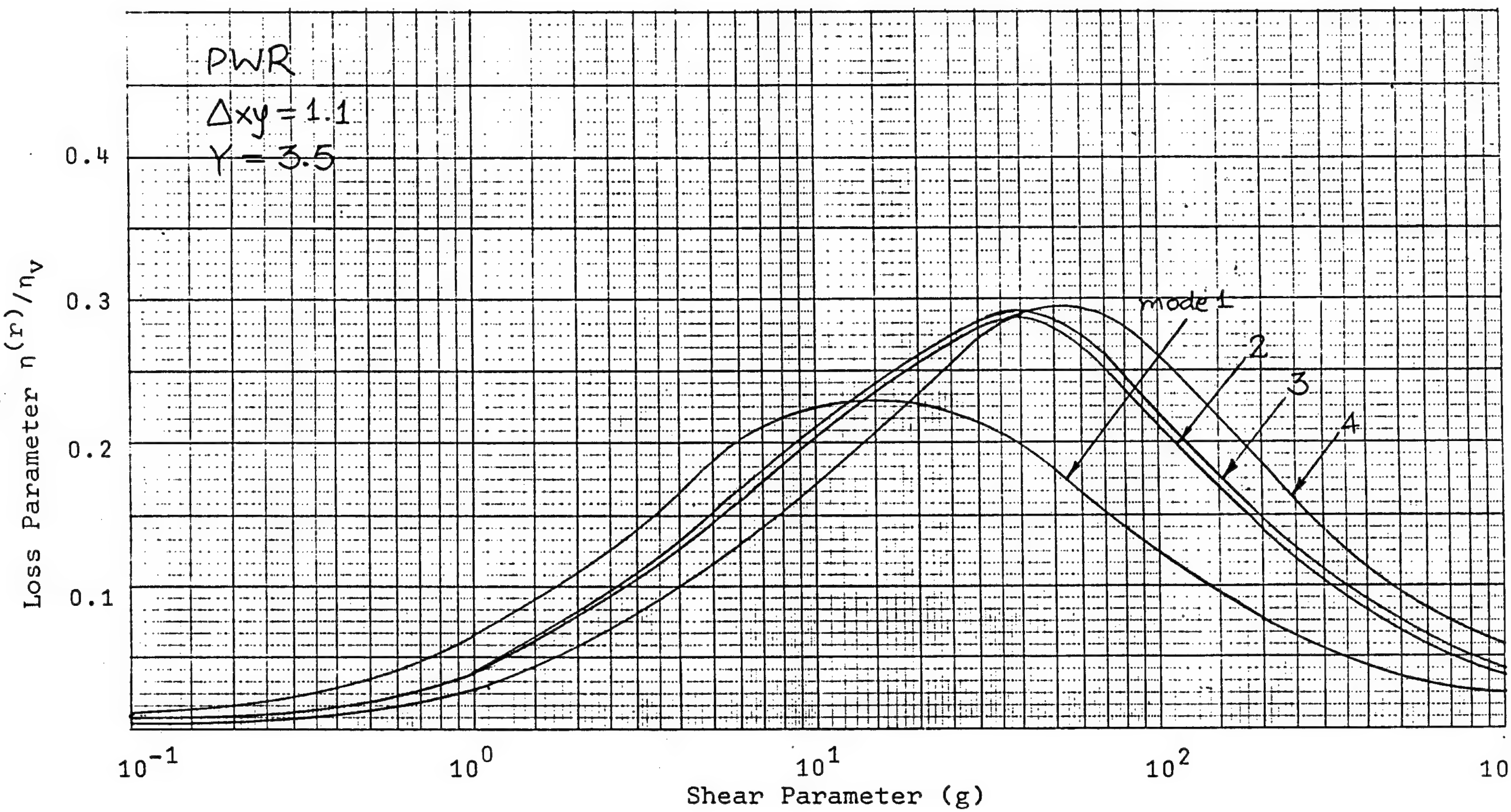

Figure 46   Damping of a sandwich rectangular plate, PWR boundary conditions, Δxy = 1.1, Y = 3.5

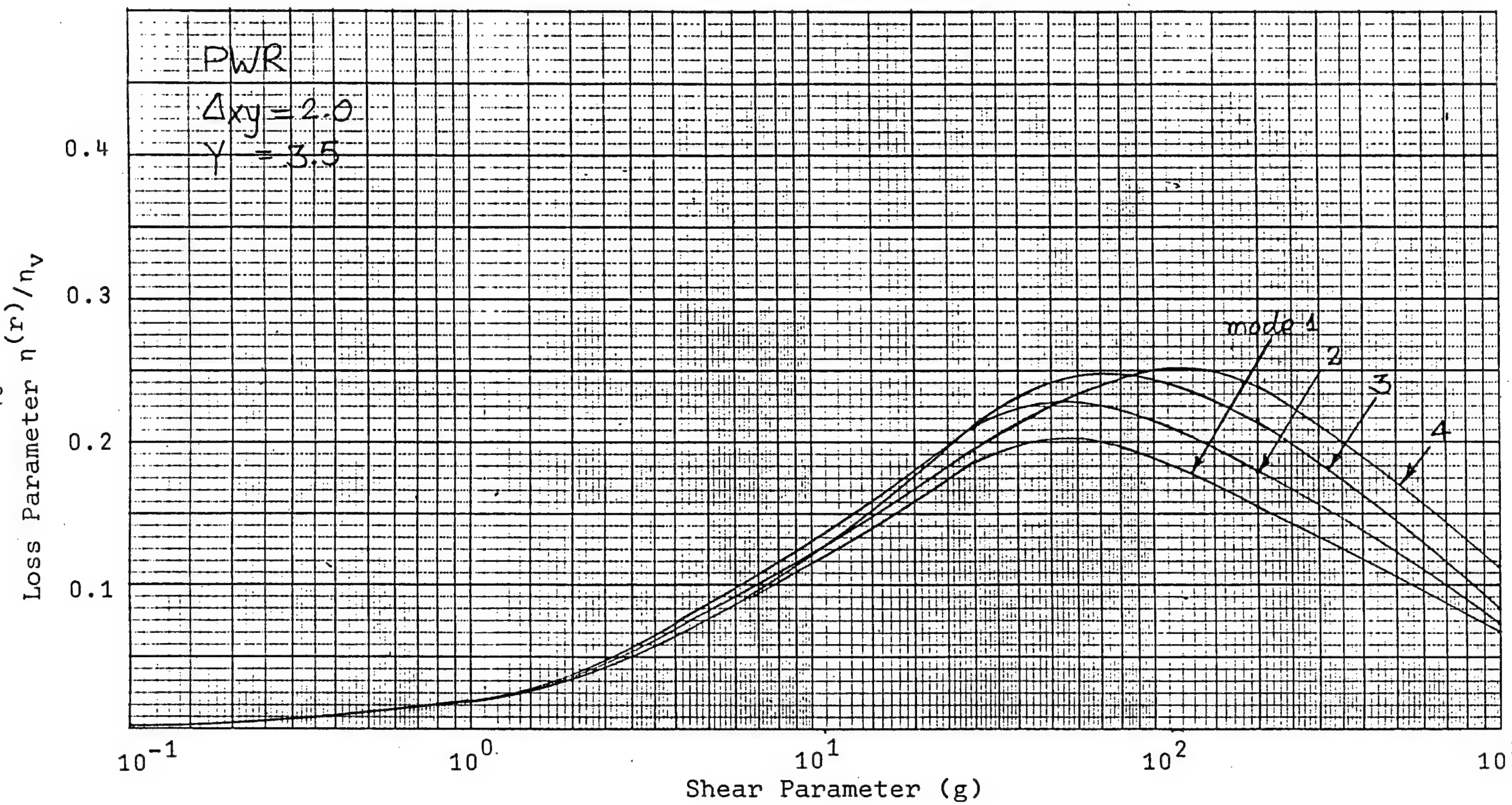

Figure 47 Damping of a sandwich rectangular plate, PWR boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

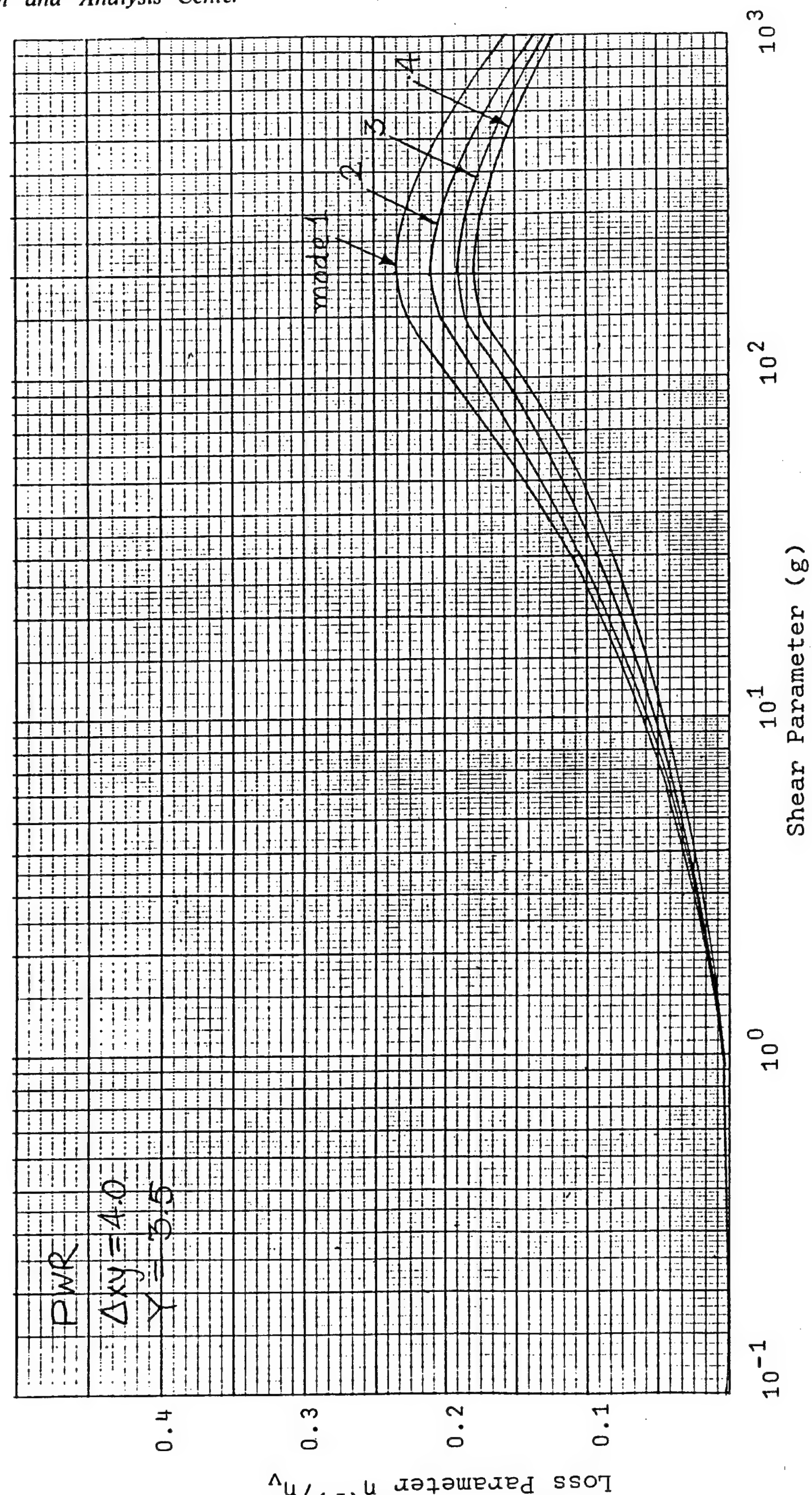

Figure 48 Damping of a sandwich rectangular plate, PWR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

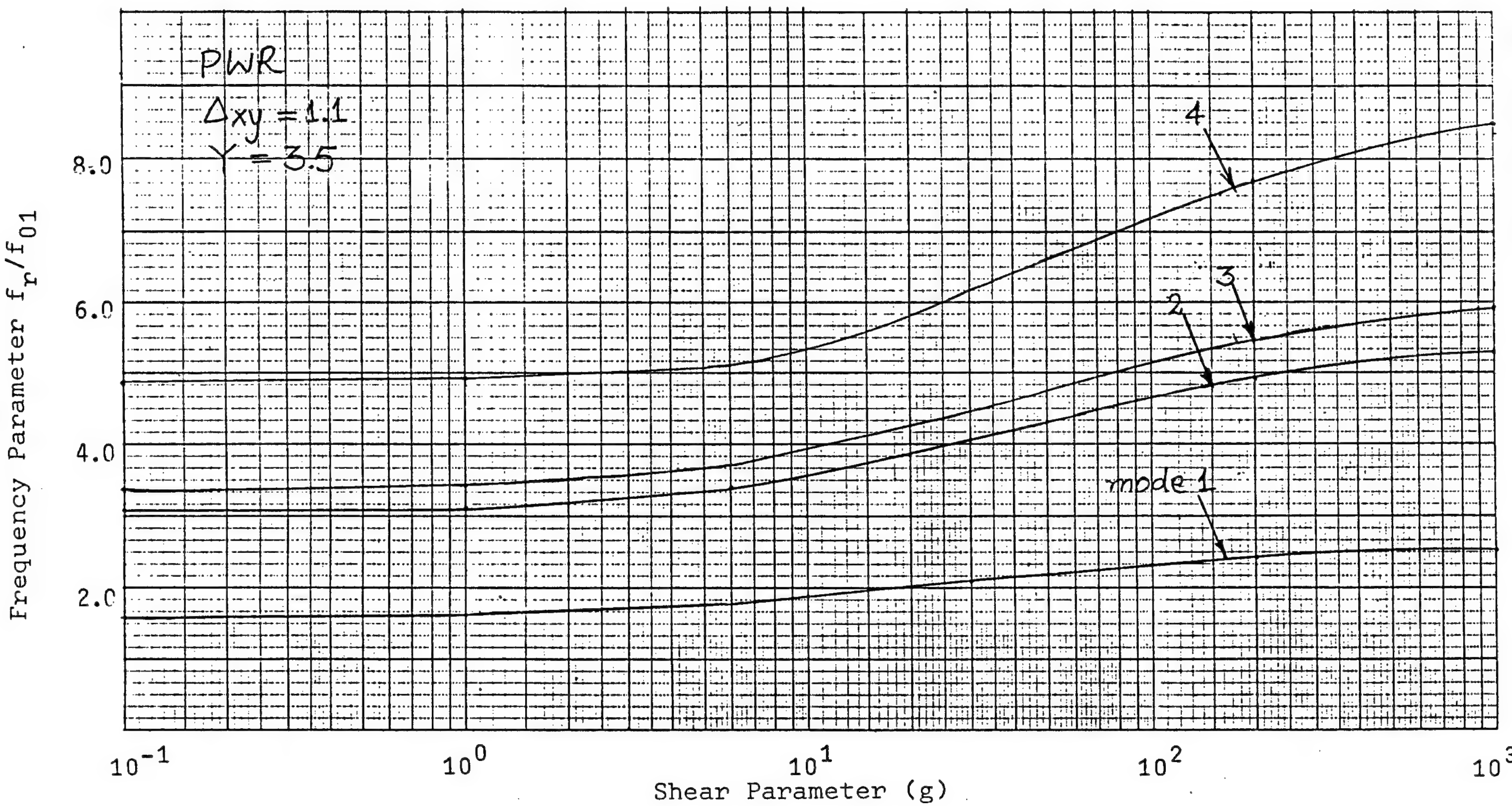

Figure 49 Natural frequencies of a sandwich rectangular plate, PWR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

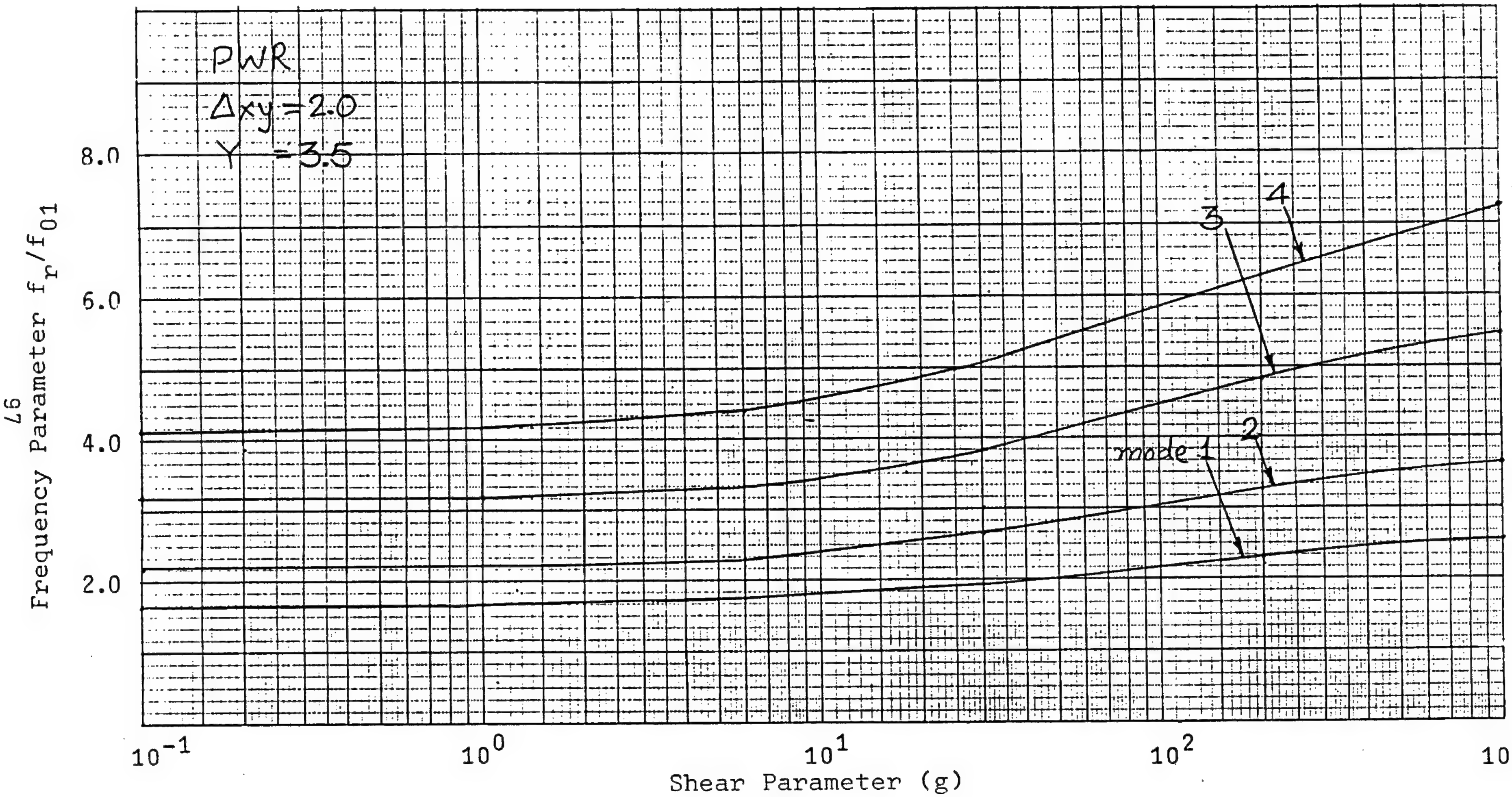

Figure 50 Natural frequencies of a sandwich rectangular plate, PWR boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

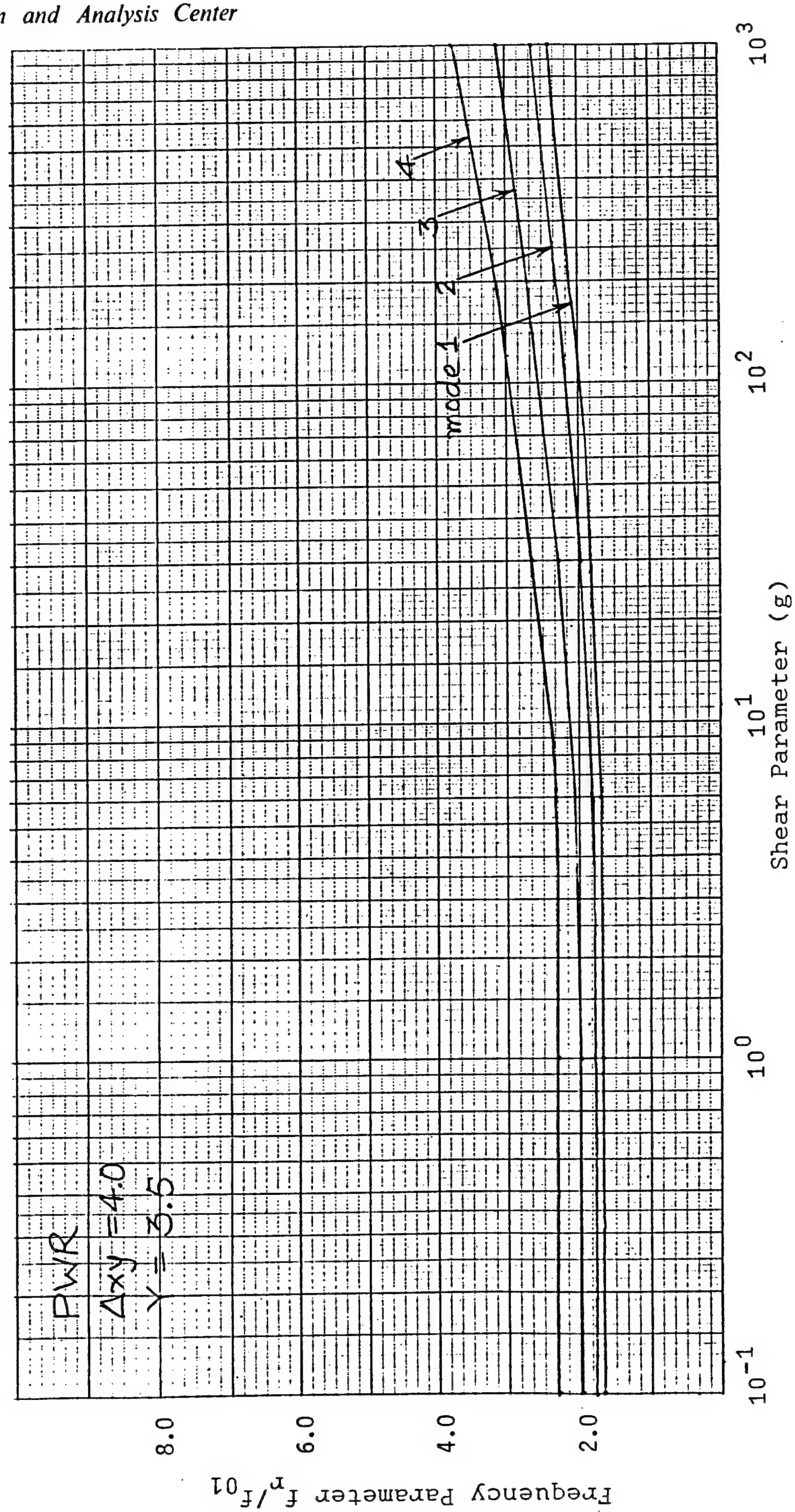

Figure 51 Natural frequencies of a sandwich rectangular plate, PWR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

TABLE 27

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PWR (zero translation, elastically restrained rotation, zero shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0 ✓		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	835.	0.005	852.	0.043	929.	0.161	195.	0.218	227.	0.094	238.	0.035
2	1612.	0.005	1645.	0.042	1789.	0.156	378.	0.247	463.	0.138	496.	0.043
3	1768.	0.005	1804.	0.041	1960.	0.155	414.	0.250	513.	0.155	557.	0.057
4	2571.	0.003	2604.	0.026	2764.	0.117	574.	0.236	724.	0.178	798.	0.064
5	2925.	0.003	2961.	0.025	3137.	0.115	649.	0.241	826.	0.197	918.	0.068
6	3351.	0.002	3388.	0.022	3573.	0.106	734.	0.235	942.	0.215	1065.	0.086
7	3847.	0.002	3883.	0.018	4063.	0.089	830.	0.212	1056.	0.216	1196.	0.084
8	4101.	0.002	4138.	0.018	4327.	0.087	881.	0.209	1126.	0.225	1286.	0.093
9	4723.	0.002	4780.	0.022	5040.	0.092	1024.	0.197	1315.	0.229	1518.	0.100
10	5295.	0.001	5331.	0.014	5518.	0.070	1118.	0.182	1410.	0.249	1638.	0.113

TABLE 28

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PWR (zero translation, elastically restrained rotation, zero shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (γ) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	1953.	0.002	1971.	0.019	2056.	0.088	410.	0.188	493.	0.154	537.	0.067
2	2607.	0.002	2634.	0.022	2766.	0.100	564.	0.211	694.	0.179	765.	0.070
3	3776.	0.002	3809.	0.0184	3980.	0.090	811.	0.210	1026.	0.215	1159.	0.084
4	4925.	0.002	4978.	0.021	5236.	0.096	1072.	0.191	1334.	0.223	1538.	0.113
5	5452.	0.002	5495.	0.015	5713.	0.076	1154.	0.187	1471.	0.251	1717.	0.113
6	5657.	0.002	5700.	0.016	5923.	0.076	1203.	0.367	1493.	0.341	1733.	0.392
7	6890.	0.001	6931.	0.011	6082.	0.007	1438.	0.387	1779.	0.348	2091.	0.400
8	7667.	0.001	7715.	0.012	7146.	0.059	1596.	0.399	2010.	0.349	2414.	0.409
9	8419.	0.001	8460.	0.009	7969.	0.060	1751.	0.407	2143.	0.351	2555.	0.401
10	10259.	0.001	10324.	0.010	8667.	0.050	2137.	0.416	2591.	0.347	3119.	0.385

TABLE 29

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PWR (zero translation, elastically restrained rotation, zero shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)	Freq. (f_r)	Loss Parameter ($\overline{\eta}$)
1	6754.	0.001	6775.	0.006	6885.	0.035	1325.	0.079	1510.	0.178	1724.	0.123
2	7214.	0.001	7240.	0.007	7375.	0.039	1440.	0.093	1666.	0.191	1914.	0.126
3	8070.	0.001	8102.	0.008	8269.	0.042	1638.	0.105	1928.	0.210	2243.	0.134
4	9291.	0.001	9329.	0.008	9528.	0.044	1919.	0.110	2285.	0.235	2702.	0.154
5	11100.	0.001	11146.	0.008	11386.	0.042	2304.	0.105	2755.	0.248	3321.	0.171
6	13358.	0.001	13411.	0.007	13692.	0.038	2785.	0.095	3515.	0.251	4061.	0.191
7	16146.	0.001	16206.	0.006	16529.	0.034	3378.	0.083	3977.	0.244	4927.	0.212
8	16815.	0.001	16911.	0.009	17418.	0.046	3762.	0.114	4437.	0.210	5306.	0.182
9	17609.	0.001	17700.	0.008	18174.	0.041	3911.	0.099	4576.	0.200	5474.	0.180
10	18798.	0.001	18870.	0.007	19286.	0.032	4033.	0.072	4670.	0.238	5744.	0.189

3.3 EXAMPLE

As a guide in using the design charts, the sample problem discussed previously in Section 2.4 will be solved. The following data are given:

Boundary conditions = simply supported, unriveted (PTU)

Base layer thickness, T_1 = 0.055 inches

Core layer thickness, T_2 = 0.0045 inches

Constraining layer thickness, T_3 = 0.055 inches

Viscoelastic shear modulus, $\overline{G}_2$ = 450 lbf/in^2

Base plate Young's modulus, E_1 = 10 x 10^6 lbf/in^2

Constraining layer Young's modulus, E_3 = 10 x 10^6 lbf/in^2

Poisson's ratio of base layer,

ν_1 = 0.3

Poisson's ratio of constraining layer,

ν_3 = 0.3

Mass density of base layer,

ρ_1 = 0.1 lbm/in^3
= 2.59 x 10^{-4} lbf-sec^2/in^4

Mass density of constraining layer,

ρ_3 = 0.1 lbm/in^3
= 2.59 x 10^{-4} lbf-sec^2/in^4

Mass density of viscoelastic layer,

ρ_2 = 0.035 lbm/in^3
= 9.07 x 10^{-5} lbf-sec^2/in^4

Core material loss factor, η_v = 0.3

Plate width, a = 10 inches

Plate length, b = 11 inches

The dimensionless variables that describe the plate are, in addition to η_v already given:

shear parameter $g = \frac{\overline{G}_2}{T_2} [\frac{1}{E_1T_1} + \frac{1}{E_3T_3}] b^2 \ (1-\nu^2)$

$$= \frac{450}{.0045}[\frac{1}{10^7 \text{ x } .055} + \frac{1}{10^7 \text{ x } .055}]11^2 \text{ x } (1-0.3^2)$$

$$= 40.0$$

D = sum of flexural stiffnesses of face sheets

$$= \frac{E_1T_1^3}{12(1-\nu_1^2)} + \frac{E_3T_3^3}{12(1-\nu_3^2)}$$

$$= \frac{10^7 \text{ x } .055^3}{12(1-0.3^2)} + \frac{10^7 \text{ x } .055^3}{12(1-0.3^2)}$$

= 304.7 lbf-in

Y = geometry parameter

$$= \frac{(T_1 + 2T_2 + T_3)^2}{4D(1-\nu^2)} \quad [\frac{E_1T_1E_3T_3}{E_1T_1 + E_3T_3})$$

$$= \frac{(.055 + 2 \text{ x } .0045 + 0.55)^2}{4 \text{ x } 304.7 \text{ x } (1-0.3^2)} [\frac{10^7 \text{ x } .055 \text{ x } 10^7 \text{ x } .055}{10^7 \text{ x } .055 + 10^7 \text{ x } .055}]$$

= 3.51

Δxy = in-plane aspect ratio

= b/a

= 11.0/10.0

= 1.10

The normalizing frequency is found from

ρ = total plate mass per unit area

$$= \rho_1T_1 + \rho_2T_2 + \rho_3T_3$$

$$= 2.59\text{x}10^{-4}\text{x}.055 + 9.07\text{x}10^{-5}\text{x}.0045 + 2.59\text{x}10^{-4}\text{x}.055$$

$= 2.89\text{x}10^{-5}$ lbf-sec^2/in^3

$$f_{01} = \frac{1}{2\pi} \; \frac{D}{\rho} \left[\left(\frac{\pi}{b}\right)^2 + \left(\frac{\pi}{a}\right)^2 \right]^2$$

$$= \frac{1}{2\pi} \; \frac{304.7}{2.89\text{x}10^{-5}} \; \left[\left(\frac{\pi}{11}\right)^2 + \left(\frac{\pi}{10}\right)^2 \right]$$

$$= 93.16 \text{ Hz}$$

Figure 6 gives damping as a function of g for PTU boundary conditions, $Y = 3.5$, and $\Delta xy = 1.1$. Entering the chart with $g = 40$ gives

$$\frac{\eta^{(1)}}{\eta_v} = 0.240 \qquad \text{for mode 1}$$

$$\frac{\eta^{(2)}}{\eta_v} = 0.336 \qquad \text{for mode 2}$$

$$\frac{\eta^{(3)}}{\eta_v} = 0.345 \qquad \text{for mode 3}$$

$$\frac{\eta^{(4)}}{\eta_v} = 0.331 \qquad \text{for mode 4}$$

or, since $\eta_v = 0.3$

$$\eta^{(1)} = 0.240 \text{ x } 0.3 = 0.072$$

$$\eta^{(2)} = 0.336 \text{ x } 0.3 = 0.101$$

$$\eta^{(3)} = 0.345 \text{ x } 0.3 = 0.104$$

$$\eta^{(4)} = 0.331 \text{ x } 0.3 = 0.099$$

Natural frequencies are found by entering Figure 21 (applicable for PTU boundary conditions, $Y = 3.5$, and $\Delta xy = 1.1$) with $g = 40$ to obtain

$$\frac{f_1}{f_{01}} = 1.75$$

$$\frac{f_2}{f_{01}} = 3.60$$

$$\frac{f_3}{f_{01}} = 4.08$$

$$\frac{f_4}{f_{01}} = 5.63$$

Then, using the calculated reference frequency of f_{01} = 93.2 Hz gives

f_1 = 1.75 x 93.16 = 163.0 Hz
f_2 = 3.60 x 93.16 = 335.4 Hz
f_3 = 4.08 x 93.16 = 380.1 Hz
f_4 = 5.63 x 93.16 = 524.5 Hz

These values may be compared with results given for the same problem in Appendix A (the raw NASTRAN output) and in Section 4.3 (the closed form solution).

4.0 CLOSED FORM SOLUTION FOR HIGH-ORDER MODES

4.1 THEORY

Structures built up from plates always have numerous high-order modes of vibration involving flexure of local sections. Calculation of all these modes with a single finite element model, while theoretically possible, is neither practical nor efficient. However, such modes can be important if high frequency excitation is present. Therefore, a method is proposed for designing a damping treatment to suppress modes of this type which avoids the cost of calculating the properties of a large number of essentially similar modes. The method is usable for either add-on or integral damping but is most likely to be used for add-on treatments.

The method is based on the fact that the higher order mode shapes of rectangular plates tend to be sinusoidal in both in-plane directions except near the boundaries. Boundary conditions have little effect on the higher order mode shapes over most of the plate area. This is true for either classical uniform plates or three-layer sandwich plates formed by adding a constrained layer damping treatment to a uniform plate. This property leads to a useful relationship between natural frequencies and modal loss factors. When modal loss factors are plotted against modal frequencies for a sandwich plate, the relationship is essentially independent of boundary conditions so long as the boundary conditions themselves are non-dissipative [10].

In the present case, we are interested in damping a number of modes over a fairly wide band of frequencies. The exact value of natural frequency for each of the many plate modes is not of particular importance. We may therefore calculate the relation between modal loss factor and modal frequency based on any convenient set of boundary conditions. The curve plotted for any other boundary condition would be formed by points at different frequencies but would still fall on or near the first, particularly for higher modes. By choosing a set of boundary conditions

which lead to a simple closed form solution, we may produce the plot of damping vs. frequency quite easily for any given material properties and plate cross-section. A few trials will usually be sufficient to find an appropriate add-on treatment based on the size, thickness, and material of the base plate and the desired frequency range.

The most convenient set of boundary conditions are those where all four sides of the plate are simply supported and shearing of the viscoelastic core is unrestrained. In this case the mode shapes are sinusoidal all the way to the edges of the plate. Two closed form solutions for this case are available in the literature [8,10]. The former solution, due to Abdulhadi, has been used in this work because the latter could not be made to produce results in agreement with MSC/NASTRAN-MSE even for small values of the core material loss factor. The Abdulhadi solution did produce good agreement for core loss factors small compared to unity. It diverged somewhat as the core loss factor approached unity, as shown in Section 2 of this report and in previous work by the authors [1].

The closed form solution from Ref. [8] for the natural frequency and modal loss factor of a simply supported rectangular sandwich plate is, using the notation of Eq. (6-8):

$$p_r = \left[\frac{\alpha_r^2 D}{\rho}\right]\left[1 + \frac{\dfrac{\delta^2 K_e}{D}\left(\dfrac{T_2 K_e \alpha_r}{\overline{G}_2} + 1 + \eta_v^2\right)}{\left(\dfrac{T_2 K_e \alpha_r}{\overline{G}_2} + 1\right)^2 + \eta_v^2}\right] \qquad (28)$$

$$\eta^{(r)} = \frac{\eta_v\left(\dfrac{T_2 K_e \alpha_r}{\overline{G}_2}\right)\left(\dfrac{K_e \delta^2}{D}\right)}{N_{1r} + N_{2r}} \qquad (29)$$

where

$$N_{1r} = \left(\frac{T_2 K_e \alpha_r}{\overline{G}_2} + 1\right)^2 + \eta_v^2 \tag{30}$$

$$N_{2r} = \frac{\delta^2 K_e}{D}\left(1 + \eta_v^2 + \frac{T_2 K_e \alpha_r}{\overline{G}_2}\right) \tag{31}$$

$$D = \frac{E_1 T_1^3}{12(1-\nu_1^2)} + \frac{E_3 T_3^3}{12(1-\nu_3^2)} \tag{32}$$

$$\delta = \frac{T_1}{2} + \frac{T_3}{2} + T_2 \tag{33}$$

$$\rho = \rho_1 T_1 + \rho_2 T_2 + \rho_3 T_3 \tag{34}$$

$$K_e = \frac{E_1 T_1 E_3 T_3}{(1+\nu_1)\,[E_1 T_1 (1-\nu_3) + E_3 T_3 (1-\nu_1)]} \tag{35}$$

p_r = radian frequency of the r'th mode

$\eta^{(r)}$ = structural loss factor of the r'th mode

η_v = material loss factor of the viscoelastic core

T_2 = thickness of the core layer

T_1, T_3 = thicknesses of the face sheets

E_1, E_2, E_3 = Young's moduli of the materials of the three layers

ν_1, ν_2, ν_3 = Poisson's ratios for the three layers

G_2^* = complex shear modulus of the core

$= \overline{G}_2(1 + i\,\eta_v)$

α_r = $\left(\frac{m\pi}{a}\right)^2 + \left(\frac{n\pi}{b}\right)^2$

a,b = in-plane dimensions of the plate

m,n = integers

The use of simply supported plate solutions for designing a damping treatment for a plate with any non-dissipative boundary conditions may seem like a gross approximation. However, the end purpose of the damping must be kept in mind. Local plate modes of an all-welded structure without any damping treatment would typically have loss factors on the order of .001. Loss factors predicted by the simple method described here are on the order of .1, even without any extensive searching for an optimum damping treatment. If boundary condition effects change the loss factors by a factor of three, the end conclusion regarding the damping treatment will remain the same; namely, that it produces a substantial (factor of 30) reduction in resonant response to periodic input forces. Complex eigenvalue solutions for sandwich beams have shown that the variation of damping with boundary conditions is small for higher modes and generally less than a factor of three for low order modes [1].

4.2 SOFTWARE IMPLEMENTATION

The equations given above have been implemented in an interactive program called SPLT61 [11]. The program allows a designer to quickly evaluate a number of possible constrained layer treatments with negligible cost for computing. The input to the program includes flexural wavelength in each direction. These are usually set equal to twice the plate dimensions, i.e., the exact value for a simply supported plate. The output is the exact (i.e., closed form, complex eigenvalue) solution for modal frequencies and loss factors of a simply supported sandwich plate. As noted above, this frequency-damping relationship is also correct in the limit of increasing mode number for other boundary conditions.

The validity of using a solution for a simply supported sandwich plate to predict damping for other boundary conditions was tested as follows. The SPLT61 program was used to obtain modal damping as a function of modal frequency for a number of different values of the shear parameter. The shear parameter was varied by changing G_2, the core shear modulus. The SPLT61 results represented an exact solution for a simply supported plate, (i.e., PTU boundary conditions). A similar analysis was performed for a plate with PLR (fixed) boundary conditions using the modal strain energy method. A comparison of results is shown in Figures 52 through 55. The damping parameter is plotted vs. normalized modal frequency for various values of the shear parameter. The frequency is normalized on a reference frequency f_{01} as described in a previous section. The same information is shown in dimensional form in Figures 56 through 60. It may be seen that the results for the drastically different boundary conditions do, in fact, converge at high frequency. Significantly, the rate of convergence depends on the shear parameter.

4.3 EXAMPLE

The use of the SPLT61 program is illustrated below. The physical situation being analyzed is the same one treated using the NASTRAN modal strain energy method in Section 2.4 and using the design charts in Section 3.3. Since true simply supported boundary conditions are assumed, and the viscoelastic loss factor is small, the SPLT61 solution agrees closely with the NASTRAN/MSE results.

The program begins by displaying default values for all the physical parameters describing a three-layer, rectangular sandwich plate. The user is prompted to change any or all of the values, to store the entire list in a disc file, or to proceed with the calculations. He has the option of resetting the entire list of values to a set previously stored on disc. Once the user is satisfied with the input data, he commands the program to proceed. It then calculates a table of natural frequencies and

modal loss factors for the first ten allowable values of wave-number in each in-plane direction (i.e., one hundred normal modes). The resulting table, along with the input parameter list, is written to a disc file in ASCII format to be printed later. The modes calculated are not necessarily the lowest one hundred, but will always contain the lowest ten.

The output file for the sample case is shown in Table 30. The loss factors are given directly rather than being normalized on the core material loss factor. They must therefore be divided by that value (0.3 for the sample case) for comparison with results from the other two methods.

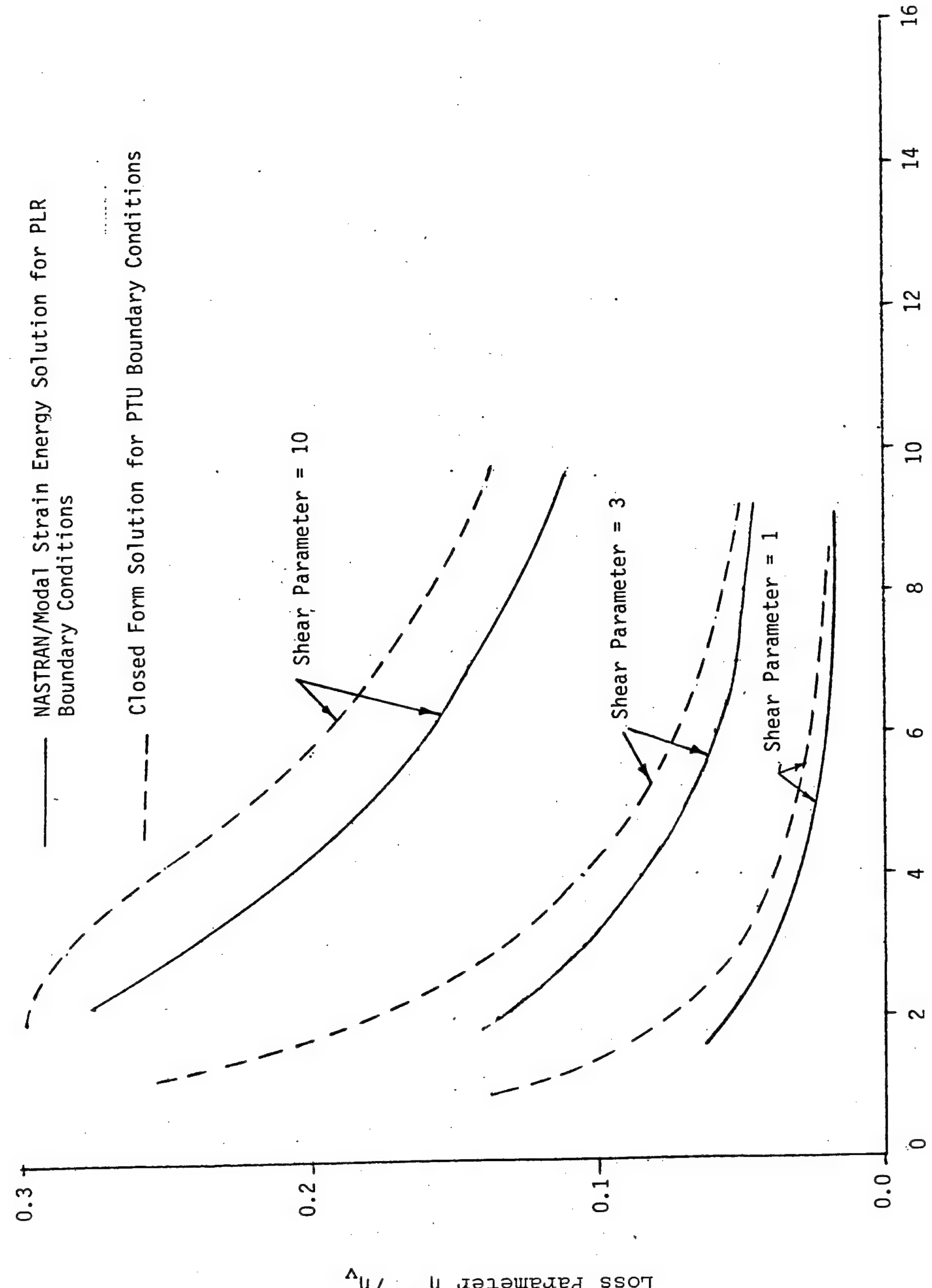

Figure 52 Effect of boundary conditions on damping for rectangular sandwich plates, g = 1,3 and 10

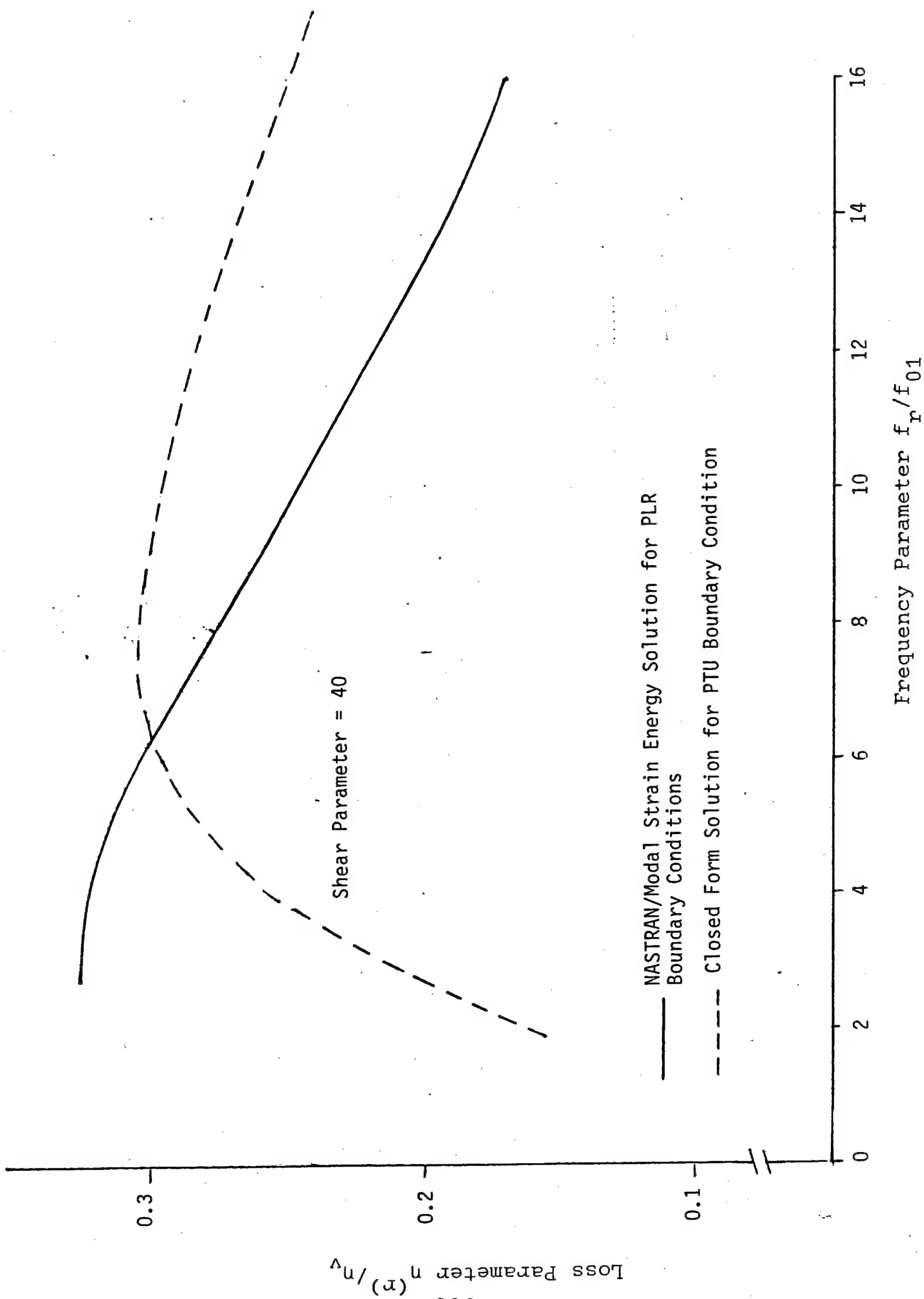

Figure 53 Effect of boundary conditions on damping for rectangular sandwich plates, g = 40

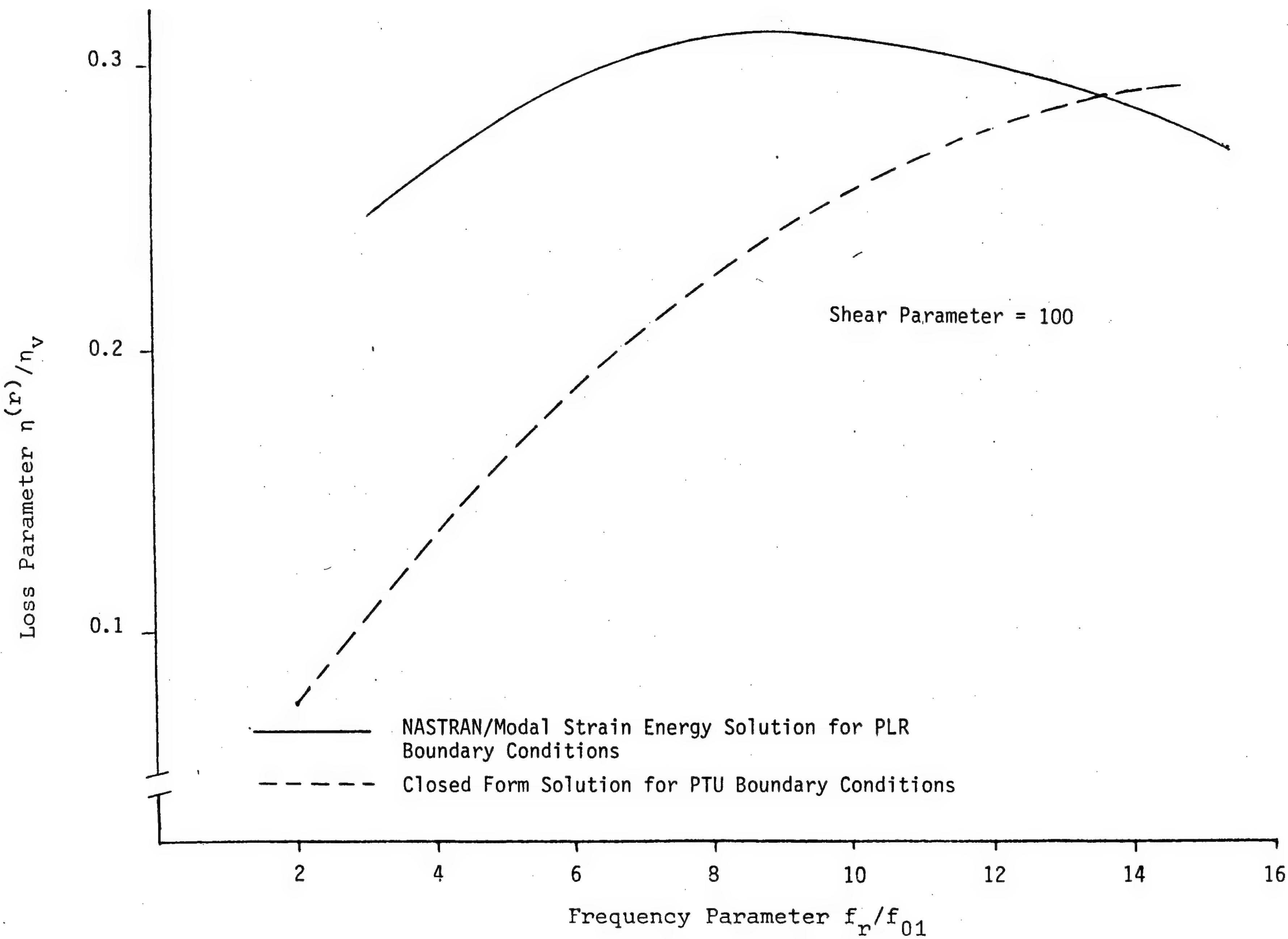

Figure 54 Effect of boundary conditions on damping for rectangular sandwich plates, g = 100

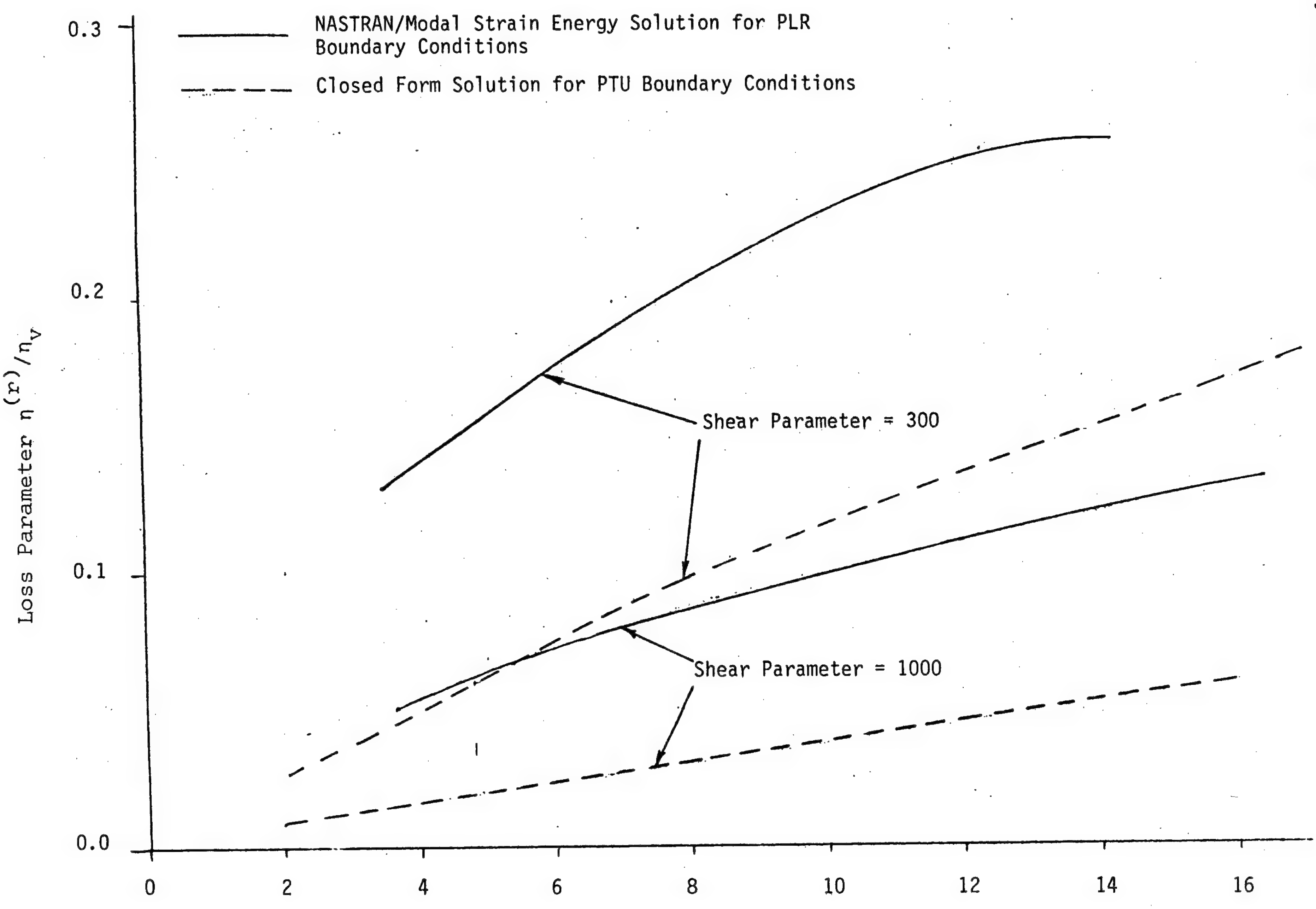

Figure 55 Effect of boundary conditions on damping for sandwich plates, g = 300 and 1000

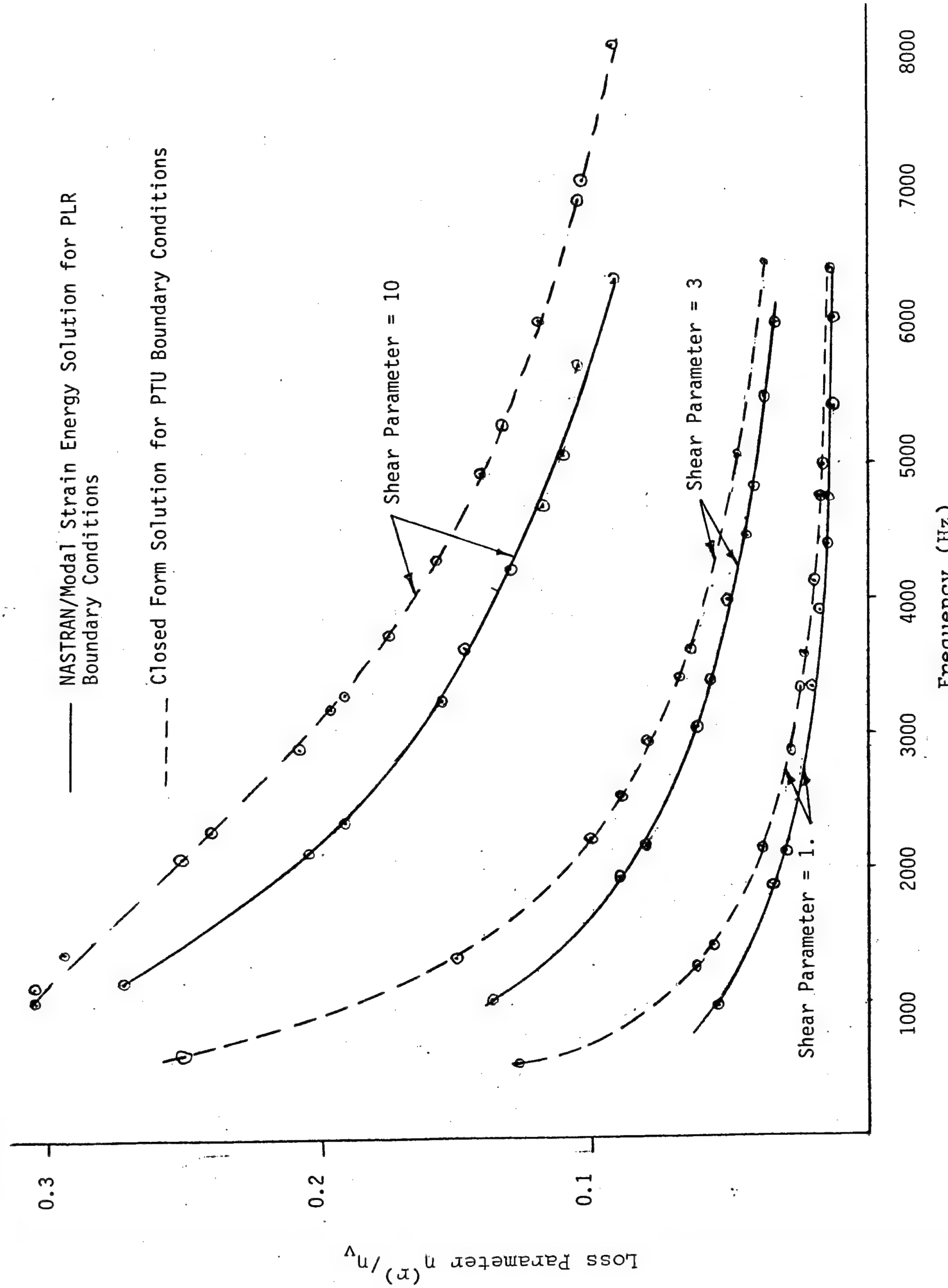

Figure 56 Effect of boundary conditions on damping for rectangular sandwich plates, g = 1,3 and 10

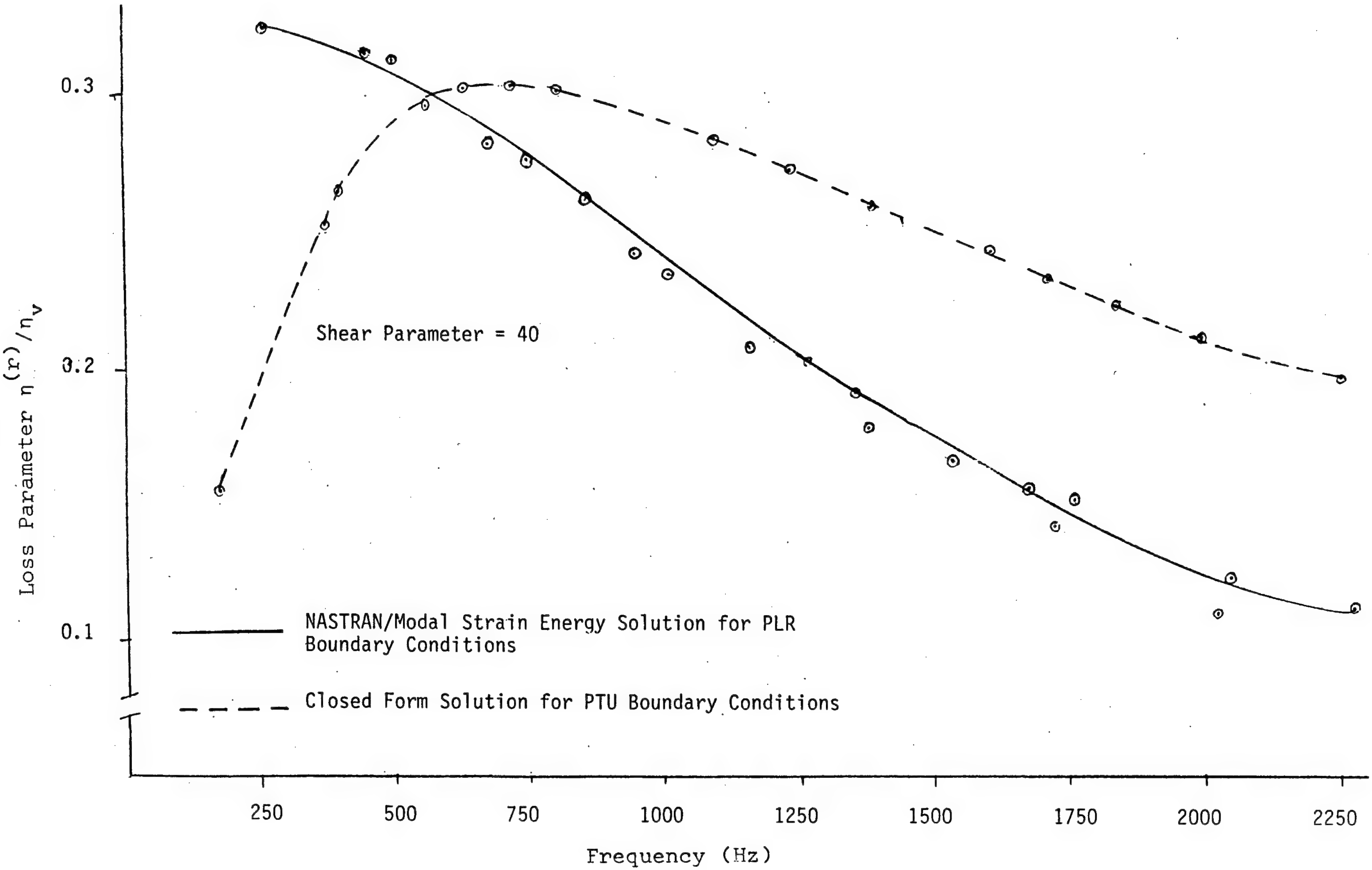

Figure 57 Effect of boundary conditions on damping for rectangular sandwich plates, g = 40

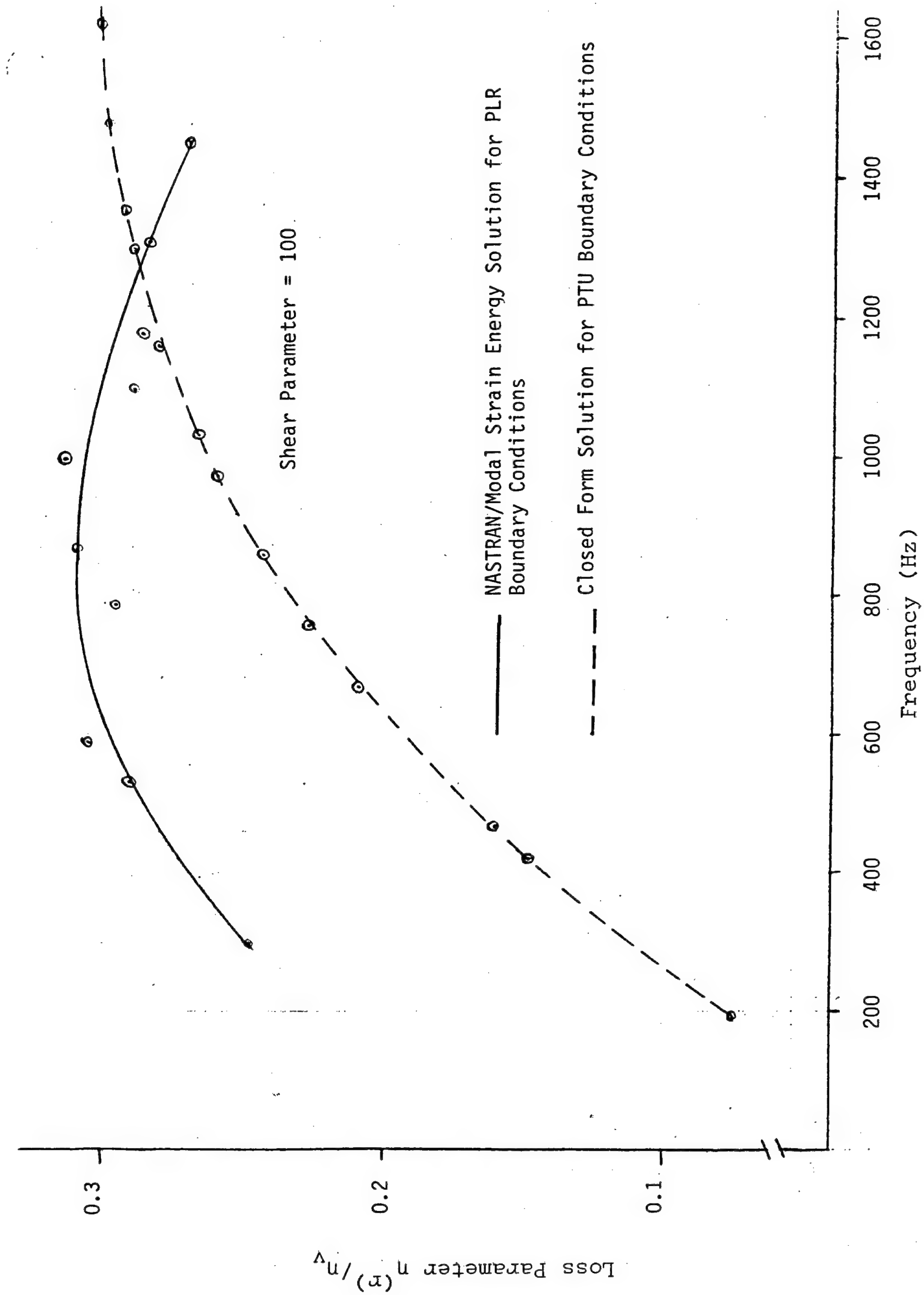

Figure 58 Effect of boundary conditions on damping for rectangular sandwich plates, g = 100

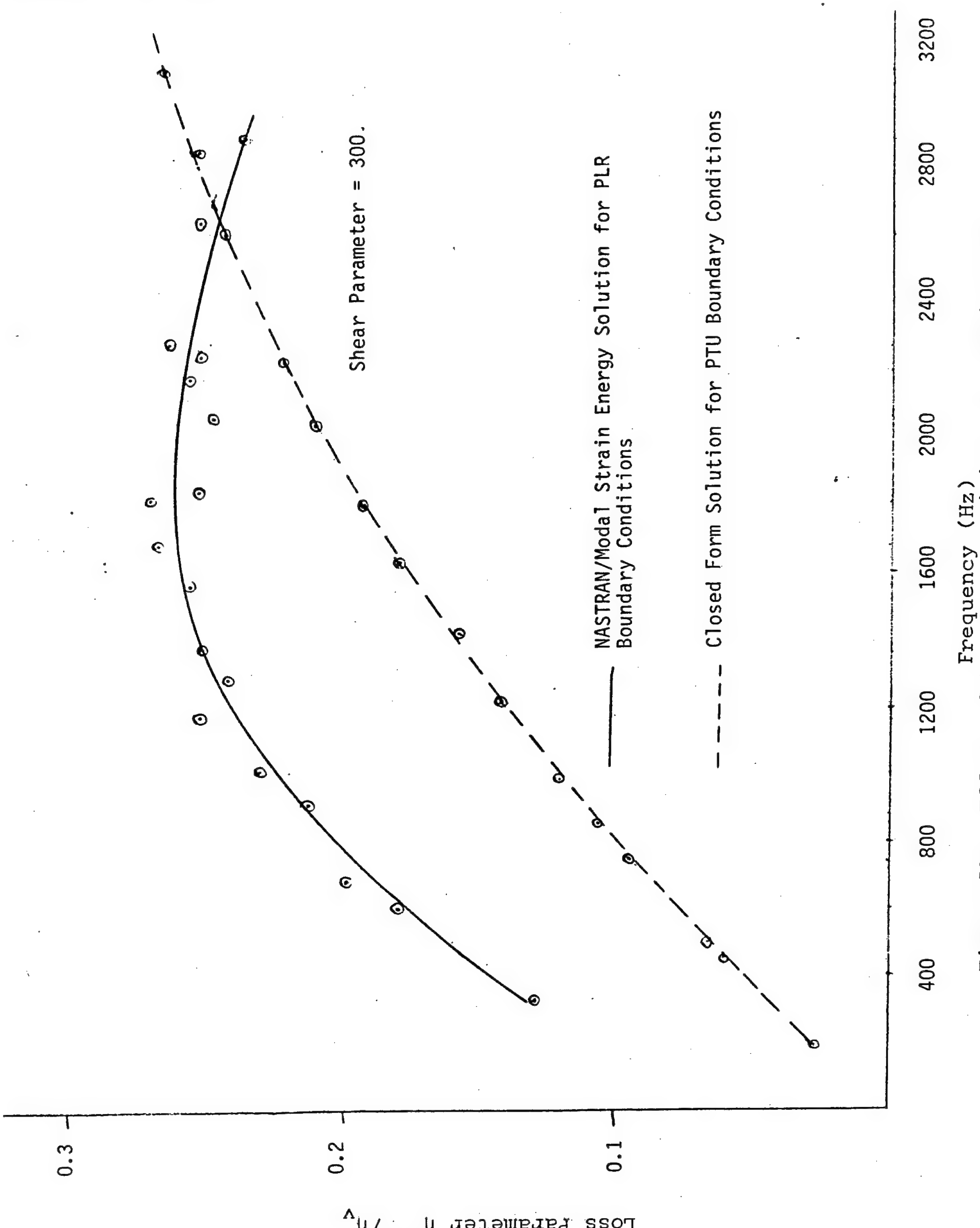

Figure 59 Effect of boundary conditions on damping for rectangular sandwich plates, g = 300

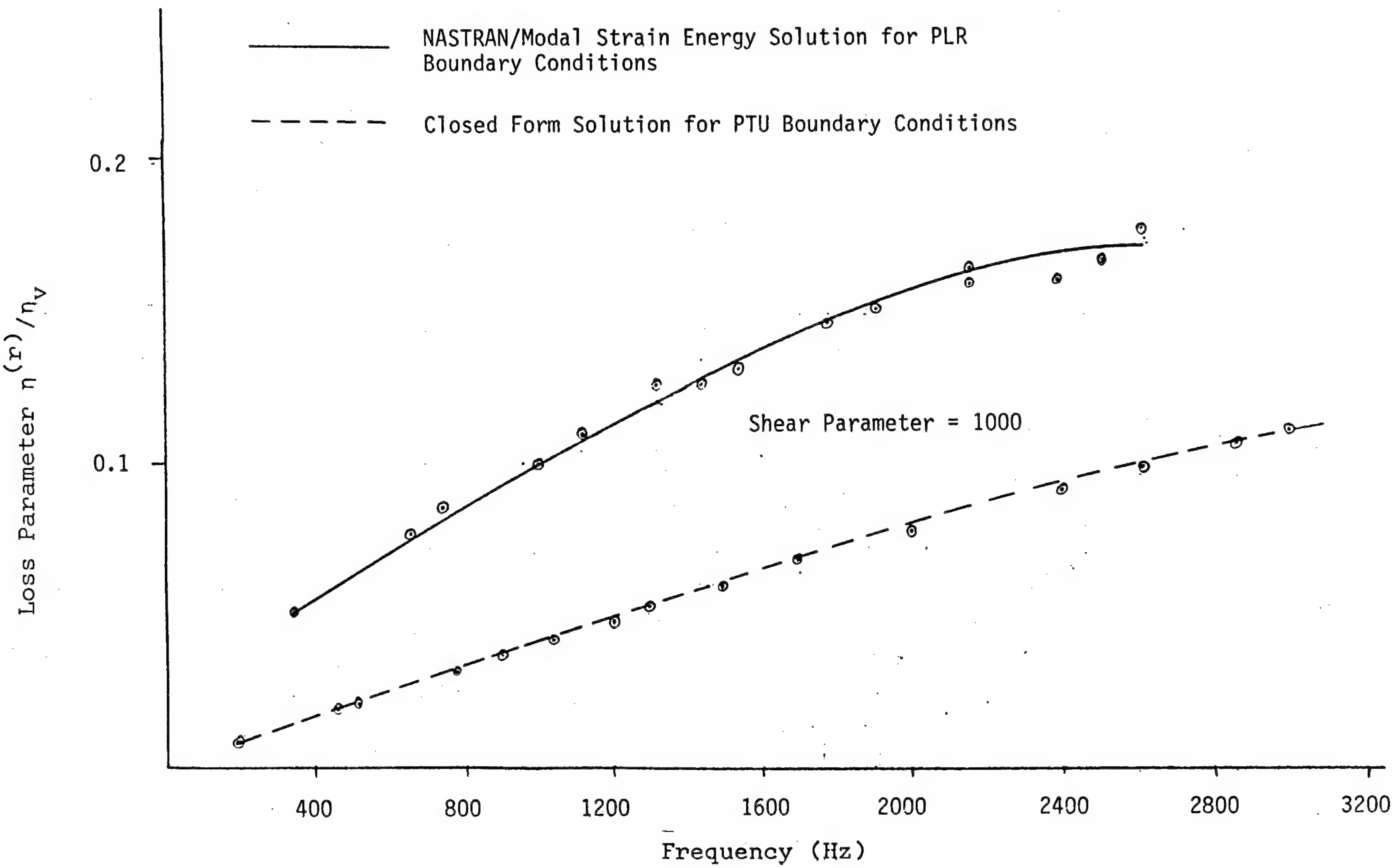

Figure 60 Effect of boundary conditions on damping for rectangular sandwich plates, g = 1000

TABLE 30 RESULTS FROM CLOSED FORM SOLUTION FOR SIMPLY SUPPORTED RECTANGULAR PLATE

PROGRAM SPLT61 07-JAN-83 10:46:25

APPROXIMATE LOSS FACTORS FOR A RECTANGULAR THREE LAYER SANDWICH PLATE

VALUES INPUT

IDENTIFIER.................................... 200.000

CONSTRAINING LAYER THICKNESS.................. 0.550000E-01
VISCOELASTIC THICKNESS 0.450000E-02
BASE LAYER THICKNESS.......................... 0.550000E-01
CONSTRAINING LAYER YOUNG"S MODULUS............ 0.100000E+08
VISCOELASTIC SHEAR MODULUS.................... 450.000
BASE PLATE YOUNG"S MODULUS .... 0.100000E+08
POISSION"S RATIO OF CONSTRAINING LAYER........ 0.300000
POISSION"S RATIO OF BASE LAYER................ 0.300000
WEIGHT DENSITY OF CONSTRAINING LAYER.......... 0.100000
WEIGHT DENSITY OF VISCOELASTIC LAYER.......... 0.350000E-01
WEIGHT DENSITY OF BASE LAYER.................. 0.100000
VISCOELASTIC LOSS FACTOR...................... 0.300000
MAXIMUM WAVELENGTH IN X DIRECTION............. 20.0000
MAXIMUM WAVELENGTH IN Y DIRECTION............. 22.0000

N		1	2	3	4	5	6	7	8	9	10
WAVELENGTH IN X DIR.		20.000	10.000	6.667	5.000	4.000	3.333	2.857	2.500	2.222	2.000
M	WAVELENGTH IN Y DIR.	FREQ/ETA									
1	22.00	169.8 .6984E-01	387.1 .1016	692.7 .1041	1083. .9152E-01	1563. .7604E-01	2138. .6217E-01	2811. .5088E-01	3583. .4196E-01	4455. .3497E-01	5429. .2947E-01
2	11.00	352.3 .9914E-01	543.5 .1059	833.8 .1001	1217. .8688E-01	1694. .7246E-01	2267. .5966E-01	2939. .4916E-01	3711. .4078E-01	4583. .3414E-01	5555. .2887E-01
3	7.33	611.4 .1055	784.9 .1016	1062. .9226E-01	1437. .7977E-01	1910. .6711E-01	2481. .5589E-01	3152. .4653E-01	3923. .3894E-01	4794. .3284E-01	5767. .2793E-01
4	5.50	940.4 .9652E-01	1104. .9076E-01	1373. .8177E-01	1742. .7121E-01	2211. .6073E-01	2780. .5131E-01	3449. .4328E-01	4219. .3663E-01	5091. .3117E-01	6063. .2672E-01
5	4.40	1343. .8272E-01	1502. .7782E-01	1765. .7063E-01	2130. .6234E-01	2596. .5404E-01	3163. .4640E-01	3832. .3971E-01	4601. .3403E-01	5471. .2926E-01	6443. .2530E-01
6	3.67	1822. .6921E-01	1978. .6556E-01	2238. .6021E-01	2601. .5397E-01	3065. .4757E-01	3631. .4151E-01	4298. .3606E-01	5066. .3130E-01	5936. .2722E-01	6908. .2376E-01
7	3.14	2381. .5761E-01	2536. .5499E-01	2794. .5111E-01	3155. .4650E-01	3618. .4164E-01	4182. .3690E-01	4848. .3252E-01	5616. .2859E-01	6486. .2515E-01	7457. .2216E-01
8	2.75	3021. .4812E-01	3175. .4626E-01	3432. .4346E-01	3792. .4005E-01	4254. .3638E-01	4818. .3270E-01	5483. .2921E-01	6251. .2600E-01	7120. .2311E-01	8091. .2056E-01
9	2.44	3743. .4048E-01	3897. .3915E-01	4154. .3712E-01	4513. .3459E-01	4974. .3181E-01	5537. .2896E-01	6202. .2618E-01	6969. .2357E-01	7838. .2117E-01	8809. .1901E-01
10	2.20	4549. .3436E-01	4702. .3339E-01	4958. .3189E-01	5317. .3001E-01	5777. .2789E-01	6340. .2567E-01	7005. .2346E-01	7772. .2134E-01	8640. .1935E-01	9611. .1753E-01

5.0 SUMMARY AND CONCLUSIONS

Three methods have been presented for the dynamic analysis and design of viscoelastically damped sandwich plates. The methods are complementary in that each represents a different trade-off of accuracy, generality, and cost of use. The theoretical basis of each has been described along with sample problems.

The most general of the three is the modal strain energy method implemented in MSC/NASTRAN. It is fairly new, having been developed primarily by the authors of this report. It can accommodate virtually any combination of plate geometry and boundary conditions. The method is by no means limited to sandwich plates, although it has seen extensive application there due to the efficiency of this construction for vibration damping. The price for the accuracy and generality of MSE is that the user must be fluent in NASTRAN and must prepare and run a finite element model for each candidate design.

A simplified version of MSC/NASTRAN-MSE for rectangular sandwich plates is presented in the form of design charts derived from a large number of MSC/NASTRAN-MSE runs. They allow the user to rapidly obtain values for modal loss factors and modal frequencies of sandwich plates with various boundary conditions Plate geometry and material properties are specified in terms of dimensionless groups to allow the maximum information to be conveyed by each chart.

The simplest of the three methods is based on the use of a closed form solution that is strictly applicable only to simply supported rectangular sandwich plates. It is shown that the solution may be used with other boundary conditions to obtain damping estimates of useful accuracy for higher order modes. The method involves negligible costs for computation and has been implemented in an interactive Fortran program.

The latter two methods are applicable only to single rectangular plates rather than to assemblages built up of plate

elements. They are nonetheless useful in that a designer often seeks to increase the damping of local modes of individual plate sections. The modal strain energy method, when implemented in NASTRAN, is quite general and will readily accommodate built-up structures with integral damping.

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APPENDIX A

SAMPLE INPUT AND OUTPUT FOR NASTRAN/MODAL STRAIN ENERGY ANALYSIS OF A SANDWICH PLATE

Sample NASTRAN input is given for the following case:

Boundary condition = PTU (zero out-of-plane translation, zero moment, unrestrained core shear)

Face sheet thicknesses (equal), $T_1 = T_3 = 0.055$ in.

Core layer thickness, $T_2 = 0.0045$ in.

Viscoelastic shear modulus, $\overline{G}_2 = 450$ lbf/in^2

Face sheet Young's moduli (equal), $E_1 = E_3 = 10^7$ lbf/in^2

Poisson's ratio of face sheets (equal), $\nu_1 = \nu_3 = 0.3$

Poisson's ratio of core layer, $\nu_2 = 0.49990$

Mass density of face sheets (equal),

$$\rho_1 = \rho_3 = 2.59 \times 10^{-4} \text{ lbf-sec}^2/\text{in}^4$$

Mass density of core layer, $\rho_2 = 9.07 \times 10^{-5}$ lbf-sec^2/in^4

Plate in-plane dimensions, a x b = 10 x 11 inches

The entire bulk data deck is listed for clarity although most of it was produced automatically by a mesh generator. Executive and case control decks are also listed. The grid and the numbering system is illustrated in Figure A-1.

Output listed for the sample case includes the first page of the eigenvalue table, mode shapes for the first four modes, and strain energy distributions for the first four modes. Set 99 includes all the solid elements used to model the core. Thus, the "percent of total" figure printed out is (after dividing by 100) exactly the strain energy fraction $V_v^{(r)}/V^{(r)}$ of Eq. 4, which equates to the loss parameter $\eta^{(r)}/\eta_v$.

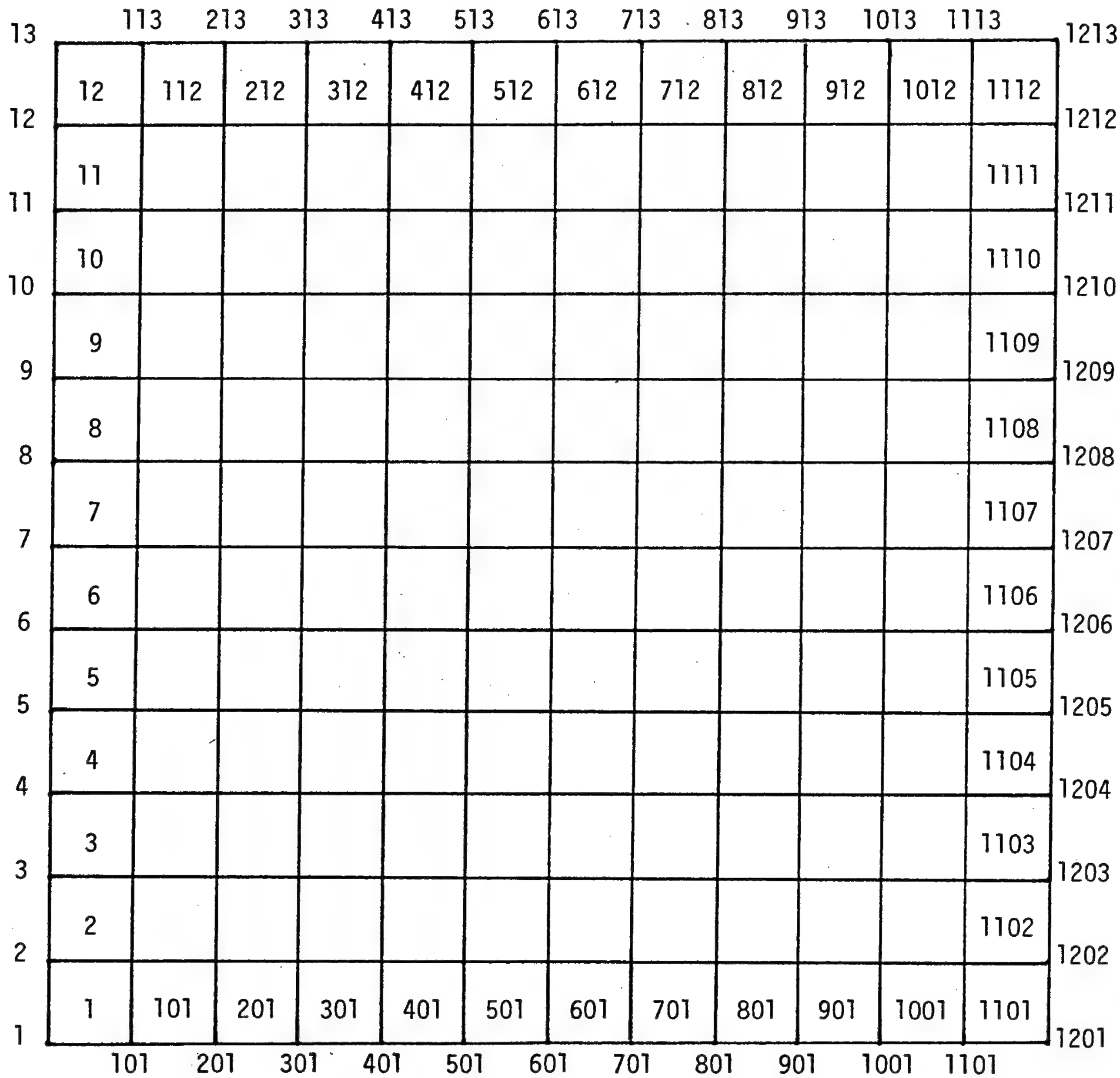

Figure A-1 Finite element grid for modal strain energy analysis of rectangular sandwich plate. Upper face sheet showing partial grid numbering and QUAD4 element numbering.

10012	10112	10212	10312	10412	10512	10612	10712	10812	10912	11012	11112
10011											11111
10010											11110
10009											11109
10008											11108
10007											11107
10006											11106
10005											11105
10004											11104
10003											11103
10002											11102
10001	10101	10201	10301	10401	10501	10601	10701	10801	10901	11001	11101

Figure A-2 Finite element grid for modal strain energy analysis of rectangular sandwich plate. Viscoelastic core layer showing partial HEXA element numbering.

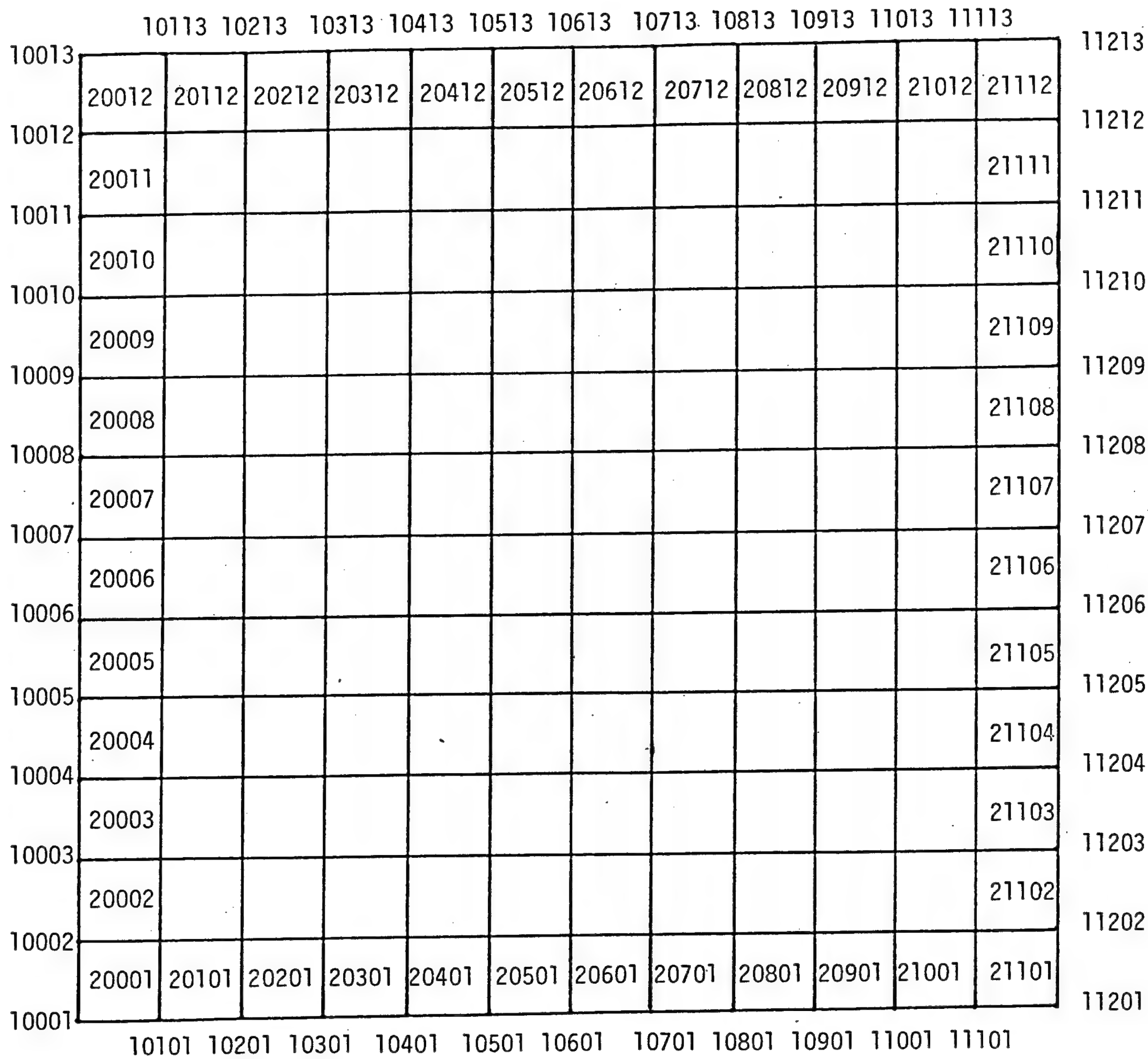

Figure A-3 Finite element grid for modal strain energy analysis of rectangular sandwich plate. Lower face sheet showing grid numbering and QUAD4 element numbering.

```
                                            JANUARY 10, 1983   NASTRAN 12/14/81    PAGE    1

      N A S T R A N   E X E C U T I V E   C O N T R O L   D E C K   E C H O

ID SAMPLE, PLATE
SOL 25,0
TIME 10
APP DISP
$GRID 500
$SEQUENCE YES
$PUNCH NONE
$ BEGINNING OF RF ALTER 25$74
$ GENERATE SEQGP BULK DATA CARDS FOR EFFICIENCY IN SYMMETRIC DECOMP.
$ THE FOLLOWING ARE USER INPUT PARAMETERS
$ VALUE                 OPTION
$ SEQOUT--OUTPUT OPTIONS FOR SEQGP CARDS
$   0  DEFAULT-NO PRINTED OR PUNCH OUTPUT
$   1  PRINT TABLE OF INTERNAL/EXTERNAL SEQUENCE IN INTERNAL ORDER
$   2  TRANSMIT THE SEQGP CARDS TO THE SYSTEM PUNCH FILE
$   3  PRINT TABLE AND PUNCH SEQGP CARDS
$ NEWSEQ--OPTIONS FOR SEQUENCING LOGIC
$  -1  PERFORM MPC OPERATIONS IF MPCX IS POSITIVE OR ZERO BUT DO
$        NOT RESEQUENCE.
$   1  DEFAULT-USE ACTIVE COLUMN SEQUENCING OPTION
$   2  USE BAND SEQUENCING OPTION
$   3  RUN BOTH ACTIVE COLUMN AND BAND SEQUENCING--SAVE THE SEQUENCE
$        WITH THE LOWEST TIME ESTIMATE FOR DECOMPOSITION
$ SUPER--OPTIONS FOR TYPES OF SEQUENCING
$   0  DEFAULT-USE PASSIVE COLUMN SEQUENCING OPTION
$  -1  USE SUPERELEMENT SEQUENCING OPTION
$ FACTOR--USED FOR THE GENERATION OF THE INTERNAL SEQUENCE NUMBER
$   SEQID = FACTOR * SEID + SEQ NUMBER
$      DEFAULT = 10000
$ MPCX--OPTION FOR MPC PROCESSING
$  -1  DEFAULT-DO NOT PROCESS MPC BULK DATA CARDS OR RIGID ELEMENTS
$   0  PROCESS RIGID ELEMENTS ONLY
$      POSITIVE INTEGER IS THE NUMBER OF THE MPC SET TO PROCESS
$      ALONG WITH ANY RIGID ELEMENTS PRESENT
$ START--STARTING POINT OPTIONS
$   0  DEFAULT-PROGRAM SELECTS STARTING POINT
$      INTEGER IS NUMBER OF POINTS TO BE USED TO START SEQUENCING
ALTER 11
COND   NOSEQP,NEWSEQ $
SEQP  GEOM1,GEOM2,GEOM4,/GEOM1Q,MATPARM/C,Y,SEQOUT=0/V,Y,NEWSEQ=+3//
        C,Y,SUPER= 0/C,Y,FACTOR=10000/C,Y,MPCX=0/C,Y,START=0 $
EQUIV    GEOM1Q,GEOM1/ALWAYS $
LABEL  NOSEQP
$ END OF RF ALTER 25$74
CEND
```

```
MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE               JANUARY  10, 1983   NASTRAN 12/14/81    PAGE      2
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****

                                   C A S E   C O N T R O L   D E C K   E C H O
             CARD
             COUNT
               1        TITLE=MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE
               2        SUBTITLE=SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE
               3        LABEL=**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****
               4        $
               5        $ SIMPLY SUPPORTED BOUNDARY CONDITION FOR BOTH SHEETS
               6        $
               7        SPC=1
               8        METHOD=77
               9        SPCFORCES=ALL
              10        SUBCASE 1
              11        MODES = 4
              12        SET 88 = 1 THRU 1213
              13        SET 99 = 10001 THRU 11112
              14        DISPLACEMENTS=88
              15        ESE = 99
              16        SUBCASE 5
              17        DISPLACEMENT=NONE
              18        BEGIN BULK

                            INPUT BULK DATA CARD COUNT =    965
```

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 3
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
1-	ASET1	3	102	104	106	108	110	112		
2-	ASET1	3	203	207	211	407				
3-	ASET1	3	302	304	306	308	310	312		
4-	ASET1	3	502	504	506	508	510	512		
5-	ASET1	3	603	605	607	609	611			
6-	ASET1	3	702	704	706	708	710	712		
7-	ASET1	3	807	1003	1007	1011				
8-	ASET1	3	902	904	906	908	910	912		
9-	ASET1	3	1102	1104	1106	1108	1110	1112		
10-	ASET1	3	10102	10104	10106	10108	10110	10112		
11-	ASET1	3	10203	10207	10211	10407				
12-	ASET1	3	10302	10304	10306	10308	10310	10312		
13-	ASET1	3	10502	10504	10506	10508	10510	10512		
14-	ASET1	3	10603	10605	10607	10609	10611			
15-	ASET1	3	10702	10704	10706	10708	10710	10712		
16-	ASET1	3	10807	11003	11007	11011				
17-	ASET1	3	10902	10904	10906	10908	10910	10912		
18-	ASET1	3	11102	11104	11106	11108	11110	11112		
19-	ASET1	12	107	203	211	407	602	605		
20-	ASET1	12	609	612	807	1003	1011	1107		
21-	ASET1	12	10107	10203	10211	10407	10602	10605		
22-	ASET1	12	10609	10612	10807	11003	11011	11107		
23-	CHEXA	10001	3	1	2	102	101	10001	10002	HEX10001
24-	+EX1000110102		10101							
25-	CHEXA	10002	3	2	3	103	102	10002	10003	HEX10002
26-	+EX1000210103		10102							
27-	CHEXA	10003	3	3	4	104	103	10003	10004	HEX10003
28-	+EX1000310104		10103							
29-	CHEXA	10004	3	4	5	105	104	10004	10005	HEX10004
30-	+EX1000410105		10104							
31-	CHEXA	10005	3	5	6	106	105	10005	10006	HEX10005
32-	+EX1000510106		10105							
33-	CHEXA	10006	3	6	7	107	106	10006	10007	HEX10006
34-	+EX1000610107		10106							
35-	CHEXA	10007	3	7	8	108	107	10007	10008	HEX10007
36-	+EX1000710108		10107							
37-	CHEXA	10008	3	8	9	109	108	10008	10009	HEX10008
38-	+EX1000810109		10108							
39-	CHEXA	10009	3	9	10	110	109	10009	10010	HEX10009
40-	+EX1000910110		10109							
41-	CHEXA	10010	3	10	11	111	110	10010	10011	HEX10010
42-	+EX1001010111		10110							
43-	CHEXA	10011	3	11	12	112	111	10011	10012	HEX10011
44-	+EX1001110112		10111							
45-	CHEXA	10012	3	12	13	113	112	10012	10013	HEX10012
46-	+EX1001210113		10112							
47-	CHEXA	10101	3	101	102	202	201	10101	10102	HEX10101
48-	+EX1010110202		10201							
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50-	+EX1010210203		10202							

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 4
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
51-	CHEXA	10103	3	103	104	204	203	10103	10104	HEX10103
52-	+EX1010310204		10203							
53-	CHEXA	10104	3	104	105	205	204	10104	10105	HEX10104
54-	+EX1010410205		10204							
55-	CHEXA	10105	3	105	106	206	205	10105	10106	HEX10105
56-	+EX1010510206		10205							
57-	CHEXA	10106	3	106	107	207	206	10106	10107	HEX10106
58-	+EX1010610207		10206							
59-	CHEXA	10107	3	107	108	208	207	10107	10108	HEX10107
60-	+EX1010710208		10207							
61-	CHEXA	10108	3	108	109	209	208	10108	10109	HEX10108
62-	+EX1010810209		10208							
63-	CHEXA	10109	3	109	110	210	209	10109	10110	HEX10109
64-	+EX1010910210		10209							
65-	CHEXA	10110	3	110	111	211	210	10110	10111	HEX10110
66-	+EX1011010211		10210							
67-	CHEXA	10111	3	111	112	212	211	10111	10112	HEX10111
68-	+EX1011110212		10211							
69-	CHEXA	10112	3	112	113	213	212	10112	10113	HEX10112
70-	+EX1011210213		10212							
71-	CHEXA	10201	3	201	202	302	301	10201	10202	HEX10201
72-	+EX1020110302		10301							
73-	CHEXA	10202	3	202	203	303	302	10202	10203	HEX10202
74-	+EX1020210303		10302							
75-	CHEXA	10203	3	203	204	304	303	10203	10204	HEX10203
76-	+EX1020310304		10303							
77-	CHEXA	10204	3	204	205	305	304	10204	10205	HEX10204
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79-	CHEXA	10205	3	205	206	306	305	10205	10206	HEX10205
80-	+EX1020510306		10305							
81-	CHEXA	10206	3	206	207	307	306	10206	10207	HEX10206
82-	+EX1020610307		10306							
83-	CHEXA	10207	3	207	208	308	307	10207	10208	HEX10207
84-	+EX1020710308		10307							
85-	CHEXA	10208	3	208	209	309	308	10208	10209	HEX10208
86-	+EX1020810309		10308							
87-	CHEXA	10209	3	209	210	310	309	10209	10210	HEX10209
88-	+EX1020910310		10309							
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90-	+EX1021010311		10310							
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92-	+EX1021110312		10311							
93-	CHEXA	10212	3	212	213	313	312	10212	10213	HEX10212
94-	+EX1021210313		10312							
95-	CHEXA	10301	3	301	302	402	401	10301	10302	HEX10301
96-	+EX1030110402		10401							
97-	CHEXA	10302	3	302	303	403	402	10302	10303	HEX10302
98-	+EX1030210403		10402							
99-	CHEXA	10303	3	303	304	404	403	10303	10304	HEX10303
100-	+EX1030310404		10403							

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE          JANUARY  10, 1983   NASTRAN 12/14/81   PAGE    5
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

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CARD
COUNT       .  1  ..  2  ..  3  ..  4  ..  5  ..  6  ..  7  ..  8  ..  9  ..  10  .
  101-      CHEXA   10304   3       304     305     405     404     10304   10305   HEX10304
  102-      +EX1030410405   10404
  103-      CHEXA   10305   3       305     306     406     405     10305   10306   HEX10305
  104-      +EX1030510406   10405
  105-      CHEXA   10306   3       306     307     407     406     10306   10307   HEX10306
  106-      +EX1030610407   10406
  107-      CHEXA   10307   3       307     308     408     407     10307   10308   HEX10307
  108-      +EX1030710408   10407
  109-      CHEXA   10308   3       308     309     409     408     10308   10309   HEX10308
  110-      +EX1030810409   10408
  111-      CHEXA   10309   3       309     310     410     409     10309   10310   HEX10309
  112-      +EX1030910410   10409
  113-      CHEXA   10310   3       310     311     411     410     10310   10311   HEX10310
  114-      +EX1031010411   10410
  115-      CHEXA   10311   3       311     312     412     411     10311   10312   HEX10311
  116-      +EX1031110412   10411
  117-      CHEXA   10312   3       312     313     413     412     10312   10313   HEX10312
  118-      +EX1031210413   10412
  119-      CHEXA   10401   3       401     402     502     501     10401   10402   HEX10401
  120-      +EX1040110502   10501
  121-      CHEXA   10402   3       402     403     503     502     10402   10403   HEX10402
  122-      +EX1040210503   10502
  123-      CHEXA   10403   3       403     404     504     503     10403   10404   HEX10403
  124-      +EX1040310504   10503
  125-      CHEXA   10404   3       404     405     505     504     10404   10405   HEX10404
  126-      +EX1040410505   10504
  127-      CHEXA   10405   3       405     406     506     505     10405   10406   HEX10405
  128-      +EX1040510506   10505
  129-      CHEXA   10406   3       406     407     507     506     10406   10407   HEX10406
  130-      +EX1040610507   10506
  131-      CHEXA   10407   3       407     408     508     507     10407   10408   HEX10407
  132-      +EX1040710508   10507
  133-      CHEXA   10408   3       408     409     509     508     10408   10409   HEX10408
  134-      +EX1040810509   10508
  135-      CHEXA   10409   3       409     410     510     509     10409   10410   HEX10409
  136-      +EX1040910510   10509
  137-      CHEXA   10410   3       410     411     511     510     10410   10411   HEX10410
  138-      +EX1041010511   10510
  139-      CHEXA   10411   3       411     412     512     511     10411   10412   HEX10411
  140-      +EX1041110512   10511
  141-      CHEXA   10412   3       412     413     513     512     10412   10413   HEX10412
  142-      +EX1041210513   10512
  143-      CHEXA   10501   3       501     502     602     601     10501   10502   HEX10501
  144-      +EX1050110602   10601
  145-      CHEXA   10502   3       502     503     603     602     10502   10503   HEX10502
  146-      +EX1050210603   10602
  147-      CHEXA   10503   3       503     504     604     603     10503   10504   HEX10503
  148-      +EX1050310604   10603
  149-      CHEXA   10504   3       504     505     605     604     10504   10505   HEX10504
  150-      +EX1050410605   10604
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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE          JANUARY  10, 1983   NASTRAN 12/14/81    PAGE    6
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****

                           S O R T E D   B U L K   D A T A   E C H O
 CARD
 COUNT      .  1  ..  2  ..  3  ..  4  ..  5  ..  6  ..  7  ..  8  ..  9  ..  10  .
  151-      CHEXA   10505   3       505     506     606     605     10505   10506   HEX10505
  152-      +EX1050510606   10605
  153-      CHEXA   10506   3       506     507     607     606     10506   10507   HEX10506
  154-      +EX1050610607   10606
  155-      CHEXA   10507   3       507     508     608     607     10507   10508   HEX10507
  156-      +EX1050710608   10607
  157-      CHEXA   10508   3       508     509     609     608     10508   10509   HEX10508
  158-      +EX1050810609   10608
  159-      CHEXA   10509   3       509     510     610     609     10509   10510   HEX10509
  160-      +EX1050910610   10609
  161-      CHEXA   10510   3       510     511     611     610     10510   10511   HEX10510
  162-      +EX1051010611   10610
  163-      CHEXA   10511   3       511     512     612     611     10511   10512   HEX10511
  164-      +EX1051110612   10611
  165-      CHEXA   10512   3       512     513     613     612     10512   10513   HEX10512
  166-      +EX1051210613   10612
  167-      CHEXA   10601   3       601     602     702     701     10601   10602   HEX10601
  168-      +EX1060110702   10701
  169-      CHEXA   10602   3       602     603     703     702     10602   10603   HEX10602
  170-      +EX1060210703   10702
  171-      CHEXA   10603   3       603     604     704     703     10603   10604   HEX10603
  172-      +EX1060310704   10703
  173-      CHEXA   10604   3       604     605     705     704     10604   10605   HEX10604
  174-      +EX1060410705   10704
  175-      CHEXA   10605   3       605     606     706     705     10605   10606   HEX10605
  176-      +EX1060510706   10705
  177-      CHEXA   10606   3       606     607     707     706     10606   10607   HEX10606
  178-      +EX1060610707   10706
  179-      CHEXA   10607   3       607     608     708     707     10607   10608   HEX10607
  180-      +EX1060710708   10707
  181-      CHEXA   10608   3       608     609     709     708     10608   10609   HEX10608
  182-      +EX1060810709   10708
  183-      CHEXA   10609   3       609     610     710     709     10609   10610   HEX10609
  184-      +EX1060910710   10709
  185-      CHEXA   10610   3       610     611     711     710     10610   10611   HEX10610
  186-      +EX1061010711   10710
  187-      CHEXA   10611   3       611     612     712     711     10611   10612   HEX10611
  188-      +EX1061110712   10711
  189-      CHEXA   10612   3       612     613     713     712     10612   10613   HEX10612
  190-      +EX1061210713   10712
  191-      CHEXA   10701   3       701     702     802     801     10701   10702   HEX10701
  192-      +EX1070110802   10801
  193-      CHEXA   10702   3       702     703     803     802     10702   10703   HEX10702
  194-      +EX1070210803   10802
  195-      CHEXA   10703   3       703     704     804     803     10703   10704   HEX10703
  196-      +EX1070310804   10803
  197-      CHEXA   10704   3       704     705     805     804     10704   10705   HEX10704
  198-      +EX1070410805   10804
  199-      CHEXA   10705   3       705     706     806     805     10705   10706   HEX10705
  200-      +EX1070510806   10805
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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE          JANUARY  10, 1983   NASTRAN 12/14/81    PAGE      7
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****

                                 S O R T E D   B U L K   D A T A   E C H O
 CARD
 COUNT     .  1  ..  2  ..  3  ..  4  ..  5  ..  6  ..  7  ..  8  ..  9  ..  10  .
  201-     CHEXA   10706   3      706    707    807    806    10706  10707  HEX10706
  202-     +EX1070610807   10806
  203-     CHEXA   10707   3      707    708    808    807    10707  10708  HEX10707
  204-     +EX1070710808   10807
  205-     CHEXA   10708   3      708    709    809    808    10708  10709  HEX10708
  206-     +EX1070810809   10808
  207-     CHEXA   10709   3      709    710    810    809    10709  10710  HEX10709
  208-     +EX1070910810   10809
  209-     CHEXA   10710   3      710    711    811    810    10710  10711  HEX10710
  210-     +EX1071010811   10810
  211-     CHEXA   10711   3      711    712    812    811    10711  10712  HEX10711
  212-     +EX1071110812   10811
  213-     CHEXA   10712   3      712    713    813    812    10712  10713  HEX10712
  214-     +EX1071210813   10812
  215-     CHEXA   10801   3      801    802    902    901    10801  10802  HEX10801
  216-     +EX1080110902   10901
  217-     CHEXA   10802   3      802    803    903    902    10802  10803  HEX10802
  218-     +EX1080210903   10902
  219-     CHEXA   10803   3      803    804    904    903    10803  10804  HEX10803
  220-     +EX1080310904   10903
  221-     CHEXA   10804   3      804    805    905    904    10804  10805  HEX10804
  222-     +EX1080410905   10904
  223-     CHEXA   10805   3      805    806    906    905    10805  10806  HEX10805
  224-     +EX1080510906   10905
  225-     CHEXA   10806   3      806    807    907    906    10806  10807  HEX10806
  226-     +EX1080610907   10906
  227-     CHEXA   10807   3      807    808    908    907    10807  10808  HEX10807
  228-     +EX1080710908   10907
  229-     CHEXA   10808   3      808    809    909    908    10808  10809  HEX10808
  230-     +EX1080810909   10908
  231-     CHEXA   10809   3      809    810    910    909    10809  10810  HEX10809
  232-     +EX1080910910   10909
  233-     CHEXA   10810   3      810    811    911    910    10810  10811  HEX10810
  234-     +EX1081010911   10910
  235-     CHEXA   10811   3      811    812    912    911    10811  10812  HEX10811
  236-     +EX1081110912   10911
  237-     CHEXA   10812   3      812    813    913    912    10812  10813  HEX10812
  238-     +EX1081210913   10912
  239-     CHEXA   10901   3      901    902    1002   1001   10901  10902  HEX10901
  240-     +EX1090111002   11001
  241-     CHEXA   10902   3      902    903    1003   1002   10902  10903  HEX10902
  242-     +EX1090211003   11002
  243-     CHEXA   10903   3      903    904    1004   1003   10903  10904  HEX10903
  244-     +EX1090311004   11003
  245-     CHEXA   10904   3      904    905    1005   1004   10904  10905  HEX10904
  246-     +EX1090411005   11004
  247-     CHEXA   10905   3      905    906    1006   1005   10905  10906  HEX10905
  248-     +EX1090511006   11005
  249-     CHEXA   10906   3      906    907    1007   1006   10906  10907  HEX10906
  250-     +EX1090611007   11006
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MUDAL STRAIN ENERGY DISTRIBUTION UF 10 IN   BY  11 IN PLATE          JANUARY  10, 1983   NASTRAN 12/14/81   PAGE    8
SIMPLY SUPPORTED CUNFIG. .055 IN FACL SFEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****

                                   S O R T E D   B U L K   D A T A   E C H O
 CARD
 CCUNT      . 1 .. 2  .. 3 ..  4 ..  5 ..  6 ..  7 ..  8 ..  9 ..  10 .
  251-      CHEXA   10907   3       907     908     1008    1007    10907   10908   HEX10907
  252-      +EX1090711008   11007
  253-      CHEXA   10908   3       908     909     1009    1008    10908   10909   HEX10908
  254-      +EX1090811009   11008
  255-      CHEXA   10909   3       909     910     1010    1009    10909   10910   HEX10909
  256-      +EX1090911010   11009
  257-      CHEXA   10910   3       910     911     1011    1010    10910   10911   HEX10910
  258-      +EX1091011011   11010
  259-      CHEXA   10911   3       911     912     1012    1011    10911   10912   HEX10911
  260-      +EX1091111012   11011
  261-      CHEXA   10912   3       912     913     1013    1012    10912   10913   HEX10912
  262-      +EX1091211013   11012
  263-      CHEXA   11001   3       1001    1002    1102    1101    11001   11002   HEX11001
  264-      +EX1100111102   11101
  265-      CHEXA   11002   3       1002    1003    1103    1102    11002   11003   HEX11002
  266-      +EX1100211103   11102
  267-      CHEXA   11003   3       1003    1004    1104    1103    11003   11004   HEX11003
  268-      +EX1100311104   11103
  269-      CHEXA   11004   3       1004    1005    1105    1104    11004   11005   HEX11004
  270-      +EX1100411105   11104
  271-      CHEXA   11005   3       1005    1006    1106    1105    11005   11006   HEX11005
  272-      +EX1100511106   11105
  273-      CHEXA   11006   3       1006    1007    1107    1106    11006   11007   HEX11006
  274-      +EX1100611107   11106
  275-      CHEXA   11007   3       1007    1008    1108    1107    11007   11008   HEX11007
  276-      +EX1100711108   11107
  277-      CHEXA   11008   3       1008    1009    1109    1108    11008   11009   HEX11008
  278-      +EX1100811109   11108
  279-      CHEXA   11009   3       1009    1010    1110    1109    11009   11010   HEX11009
  280-      +EX1100911110   11109
  281-      CHEXA   11010   3       1010    1011    1111    1110    11010   11011   HEX11010
  282-      +EX1101011111   11110
  283-      CHEXA   11011   3       1011    1012    1112    1111    11011   11012   HEX11011
  284-      +EX1101111112   11111
  285-      CHEXA   11012   3       1012    1013    1113    1112    11012   11013   HEX11012
  286-      +EX1101211113   11112
  287-      CHEXA   11101   3       1101    1102    1202    1201    11101   11102   HEX11101
  288-      +EX1110111202   11201
  289-      CHEXA   11102   3       1102    1103    1203    1202    11102   11103   HEX11102
  290-      +EX1110211203   11202
  291-      CHEXA   11103   3       1103    1104    1204    1203    11103   11104   HEX11103
  292-      +EX1110311204   11203
  293-      CHEXA   11104   3       1104    1105    1205    1204    11104   11105   HEX11104
  294-      +EX1110411205   11204
  295-      CHEXA   11105   3       1105    1106    1206    1205    11105   11106   HEX11105
  296-      +EX1110511206   11205
  297-      CHEXA   11106   3       1106    1107    1207    1206    11106   11107   HEX11106
  298-      +EX1110611207   11206
  299-      CHEXA   11107   3       1107    1108    1208    1207    11107   11108   HEX11107
  300-      +EX1110711208   11207
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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 9
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
301-	CHEXA	11108	3	1108	1109	1209	1208	11108	11109	HEX11108
302-	+EX11108	11209	11208							
303-	CHEXA	11109	3	1109	1110	1210	1209	11109	11110	HEX11109
304-	+EX11109	11210	11209							
305-	CHEXA	11110	3	1110	1111	1211	1210	11110	11111	HEX11110
306-	+EX11110	11211	11210							
307-	CHEXA	11111	3	1111	1112	1212	1211	11111	11112	HEX11111
308-	+EX11111	11212	11211							
309-	CHEXA	11112	3	1112	1113	1213	1212	11112	11113	HEX11112
310-	+EX11112	11213	11212							
311-	CQUAD4	1	1	1	2	102	101			
312-	CQUAD4	2	1	2	3	103	102			
313-	CQUAD4	3	1	3	4	104	103			
314-	CQUAD4	4	1	4	5	105	104			
315-	CQUAD4	5	1	5	6	106	105			
316-	CQUAD4	6	1	6	7	107	106			
317-	CQUAD4	7	1	7	8	108	107			
318-	CQUAD4	8	1	8	9	109	108			
319-	CQUAD4	9	1	9	10	110	109			
320-	CQUAD4	10	1	10	11	111	110			
321-	CQUAD4	11	1	11	12	112	111			
322-	CQUAD4	12	1	12	13	113	112			
323-	CQUAD4	101	1	101	102	202	201			
324-	CQUAD4	102	1	102	103	203	202			
325-	CQUAD4	103	1	103	104	204	203			
326-	CQUAD4	104	1	104	105	205	204			
327-	CQUAD4	105	1	105	106	206	205			
328-	CQUAD4	106	1	106	107	207	206			
329-	CQUAD4	107	1	107	108	208	207			
330-	CQUAD4	108	1	108	109	209	208			
331-	CQUAD4	109	1	109	110	210	209			
332-	CQUAD4	110	1	110	111	211	210			
333-	CQUAD4	111	1	111	112	212	211			
334-	CQUAD4	112	1	112	113	213	212			
335-	CQUAD4	201	1	201	202	302	301			
336-	CQUAD4	202	1	202	203	303	302			
337-	CQUAD4	203	1	203	204	304	303			
338-	CQUAD4	204	1	204	205	305	304			
339-	CQUAD4	205	1	205	206	306	305			
340-	CQUAD4	206	1	206	207	307	306			
341-	CQUAD4	207	1	207	208	308	307			
342-	CQUAD4	208	1	208	209	309	308			
343-	CQUAD4	209	1	209	210	310	309			
344-	CQUAD4	210	1	210	211	311	310			
345-	CQUAD4	211	1	211	212	312	311			
346-	CQUAD4	212	1	212	213	313	312			
347-	CQUAD4	301	1	301	302	402	401			
348-	CQUAD4	302	1	302	303	403	402			
349-	CQUAD4	303	1	303	304	404	403			
350-	CQUAD4	304	1	304	305	405	404			

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 10
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D   B U L K   D A T A   E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
351-	CQUAD4	305	1	305	306	406	405			
352-	CQUAD4	306	1	306	307	407	406			
353-	CQUAD4	307	1	307	308	408	407			
354-	CQUAD4	308	1	308	309	409	408			
355-	CQUAD4	309	1	309	310	410	409			
356-	CQUAD4	310	1	310	311	411	410			
357-	CQUAD4	311	1	311	312	412	411			
358-	CQUAD4	312	1	312	313	413	412			
359-	CQUAD4	401	1	401	402	502	501			
360-	CQUAD4	402	1	402	403	503	502			
361-	CQUAD4	403	1	403	404	504	503			
362-	CQUAD4	404	1	404	405	505	504			
363-	CQUAD4	405	1	405	406	506	505			
364-	CQUAD4	406	1	406	407	507	506			
365-	CQUAD4	407	1	407	408	508	507			
366-	CQUAD4	408	1	408	409	509	508			
367-	CQUAD4	409	1	409	410	510	509			
368-	CQUAD4	410	1	410	411	511	510			
369-	CQUAD4	411	1	411	412	512	511			
370-	CQUAD4	412	1	412	413	513	512			
371-	CQUAD4	501	1	501	502	602	601			
372-	CQUAD4	502	1	502	503	603	602			
373-	CQUAD4	503	1	503	504	604	603			
374-	CQUAD4	504	1	504	505	605	604			
375-	CQUAD4	505	1	505	506	606	605			
376-	CQUAD4	506	1	506	507	607	606			
377-	CQUAD4	507	1	507	508	608	607			
378-	CQUAD4	508	1	508	509	609	608			
379-	CQUAD4	509	1	509	510	610	609			
380-	CQUAD4	510	1	510	511	611	610			
381-	CQUAD4	511	1	511	512	612	611			
382-	CQUAD4	512	1	512	513	613	612			
383-	CQUAD4	601	1	601	602	702	701			
384-	CQUAD4	602	1	602	603	703	702			
385-	CQUAD4	603	1	603	604	704	703			
386-	CQUAD4	604	1	604	605	705	704			
387-	CQUAD4	605	1	605	606	706	705			
388-	CQUAD4	606	1	606	607	707	706			
389-	CQUAD4	607	1	607	608	708	707			
390-	CQUAD4	608	1	608	609	709	708			
391-	CQUAD4	609	1	609	610	710	709			
392-	CQUAD4	610	1	610	611	711	710			
393-	CQUAD4	611	1	611	612	712	711			
394-	CQUAD4	612	1	612	613	713	712			
395-	CQUAD4	701	1	701	702	802	801			
396-	CQUAD4	702	1	702	703	803	802			
397-	CQUAD4	703	1	703	704	804	803			
398-	CQUAD4	704	1	704	705	805	804			
399-	CQUAD4	705	1	705	706	806	805			
400-	CQUAD4	706	1	706	707	807	806			

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE             JANUARY  10, 1983   NASTRAN 12/14/81    PAGE    11
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****

                                   S O R T E D   B U L K   D A T A   E C H O
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CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 .. 9 .. 10 .
401-	CQUAD4	707	1	707	708	808	807	
402-	CQUAD4	708	1	708	709	809	808	
403-	CQUAD4	709	1	709	710	810	809	
404-	CQUAD4	710	1	710	711	811	810	
405-	CQUAD4	711	1	711	712	812	811	
406-	CQUAD4	712	1	712	713	813	812	
407-	CQUAD4	801	1	801	802	902	901	
408-	CQUAD4	802	1	802	803	903	902	
409-	CQUAD4	803	1	803	804	904	903	
410-	CQUAD4	804	1	804	805	905	904	
411-	CQUAD4	805	1	805	806	906	905	
412-	CQUAD4	806	1	806	807	907	906	
413-	CQUAD4	807	1	807	808	908	907	
414-	CQUAD4	808	1	808	809	909	908	
415-	CQUAD4	809	1	809	810	910	909	
416-	CQUAD4	810	1	810	811	911	910	
417-	CQUAD4	811	1	811	812	912	911	
418-	CQUAD4	812	1	812	813	913	912	
419-	CQUAD4	901	1	901	902	1002	1001	
420-	CQUAD4	902	1	902	903	1003	1002	
421-	CQUAD4	903	1	903	904	1004	1003	
422-	CQUAD4	904	1	904	905	1005	1004	
423-	CQUAD4	905	1	905	906	1006	1005	
424-	CQUAD4	906	1	906	907	1007	1006	
425-	CQUAD4	907	1	907	908	1008	1007	
426-	CQUAD4	908	1	908	909	1009	1008	
427-	CQUAD4	909	1	909	910	1010	1009	
428-	CQUAD4	910	1	910	911	1011	1010	
429-	CQUAD4	911	1	911	912	1012	1011	
430-	CQUAD4	912	1	912	913	1013	1012	
431-	CQUAD4	1001	1	1001	1002	1102	1101	
432-	CQUAD4	1002	1	1002	1003	1103	1102	
433-	CQUAD4	1003	1	1003	1004	1104	1103	
434-	CQUAD4	1004	1	1004	1005	1105	1104	
435-	CQUAD4	1005	1	1005	1006	1106	1105	
436-	CQUAD4	1006	1	1006	1007	1107	1106	
437-	CQUAD4	1007	1	1007	1008	1108	1107	
438-	CQUAD4	1008	1	1008	1009	1109	1108	
439-	CQUAD4	1009	1	1009	1010	1110	1109	
440-	CQUAD4	1010	1	1010	1011	1111	1110	
441-	CQUAD4	1011	1	1011	1012	1112	1111	
442-	CQUAD4	1012	1	1012	1013	1113	1112	
443-	CQUAD4	1101	1	1101	1102	1202	1201	
444-	CQUAD4	1102	1	1102	1103	1203	1202	
445-	CQUAD4	1103	1	1103	1104	1204	1203	
446-	CQUAD4	1104	1	1104	1105	1205	1204	
447-	CQUAD4	1105	1	1105	1106	1206	1205	
448-	CQUAD4	1106	1	1106	1107	1207	1206	
449-	CQUAD4	1107	1	1107	1108	1208	1207	
450-	CQUAD4	1108	1	1108	1109	1209	1208	

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 12
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
451-	CQUAD4	1109	1	1109	1110	1210	1209			
452-	CQUAD4	1110	1	1110	1111	1211	1210			
453-	CQUAD4	1111	1	1111	1112	1212	1211			
454-	CQUAD4	1112	1	1112	1113	1213	1212			
455-	CQUAD4	20001	2	10001	10002	10102	10101			
456-	CQUAD4	20002	2	10002	10003	10103	10102			
457-	CQUAD4	20003	2	10003	10004	10104	10103			
458-	CQUAD4	20004	2	10004	10005	10105	10104			
459-	CQUAD4	20005	2	10005	10006	10106	10105			
460-	CQUAD4	20006	2	10006	10007	10107	10106			
461-	CQUAD4	20007	2	10007	10008	10108	10107			
462-	CQUAD4	20008	2	10008	10009	10109	10108			
463-	CQUAD4	20009	2	10009	10010	10110	10109			
464-	CQUAD4	20010	2	10010	10011	10111	10110			
465-	CQUAD4	20011	2	10011	10012	10112	10111			
466-	CQUAD4	20012	2	10012	10013	10113	10112			
467-	CQUAD4	20101	2	10101	10102	10202	10201			
468-	CQUAD4	20102	2	10102	10103	10203	10202			
469-	CQUAD4	20103	2	10103	10104	10204	10203			
470-	CQUAD4	20104	2	10104	10105	10205	10204			
471-	CQUAD4	20105	2	10105	10106	10206	10205			
472-	CQUAD4	20106	2	10106	10107	10207	10206			
473-	CQUAD4	20107	2	10107	10108	10208	10207			
474-	CQUAD4	20108	2	10108	10109	10209	10208			
475-	CQUAD4	20109	2	10109	10110	10210	10209			
476-	CQUAD4	20110	2	10110	10111	10211	10210			
477-	CQUAD4	20111	2	10111	10112	10212	10211			
478-	CQUAD4	20112	2	10112	10113	10213	10212			
479-	CQUAD4	20201	2	10201	10202	10302	10301			
480-	CQUAD4	20202	2	10202	10203	10303	10302			
481-	CQUAD4	20203	2	10203	10204	10304	10303			
482-	CQUAD4	20204	2	10204	10205	10305	10304			
483-	CQUAD4	20205	2	10205	10206	10306	10305			
484-	CQUAD4	20206	2	10206	10207	10307	10306			
485-	CQUAD4	20207	2	10207	10208	10308	10307			
486-	CQUAD4	20208	2	10208	10209	10309	10308			
487-	CQUAD4	20209	2	10209	10210	10310	10309			
488-	CQUAD4	20210	2	10210	10211	10311	10310			
489-	CQUAD4	20211	2	10211	10212	10312	10311			
490-	CQUAD4	20212	2	10212	10213	10313	10312			
491-	CQUAD4	20301	2	10301	10302	10402	10401			
492-	CQUAD4	20302	2	10302	10303	10403	10402			
493-	CQUAD4	20303	2	10303	10304	10404	10403			
494-	CQUAD4	20304	2	10304	10305	10405	10404			
495-	CQUAD4	20305	2	10305	10306	10406	10405			
496-	CQUAD4	20306	2	10306	10307	10407	10406			
497-	CQUAD4	20307	2	10307	10308	10408	10407			
498-	CQUAD4	20308	2	10308	10309	10409	10408			
499-	CQUAD4	20309	2	10309	10310	10410	10409			
500-	CQUAD4	20310	2	10310	10311	10411	10410			

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983   NASTRAN 12/14/81   PAGE 13
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D   B U L K   D A T A   E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
501-	CQUAD4	20311	2	10311	10312	10412	10411			
502-	CQUAD4	20312	2	10312	10313	10413	10412			
503-	CQUAD4	20401	2	10401	10402	10502	10501			
504-	CQUAD4	20402	2	10402	10403	10503	10502			
505-	CQUAD4	20403	2	10403	10404	10504	10503			
506-	CQUAD4	20404	2	10404	10405	10505	10504			
507-	CQUAD4	20405	2	10405	10406	10506	10505			
508-	CQUAD4	20406	2	10406	10407	10507	10506			
509-	CQUAD4	20407	2	10407	10408	10508	10507			
510-	CQUAD4	20408	2	10408	10409	10509	10508			
511-	CQUAD4	20409	2	10409	10410	10510	10509			
512-	CQUAD4	20410	2	10410	10411	10511	10510			
513-	CQUAD4	20411	2	10411	10412	10512	10511			
514-	CQUAD4	20412	2	10412	10413	10513	10512			
515-	CQUAD4	20501	2	10501	10502	10602	10601			
516-	CQUAD4	20502	2	10502	10503	10603	10602			
517-	CQUAD4	20503	2	10503	10504	10604	10603			
518-	CQUAD4	20504	2	10504	10505	10605	10604			
519-	CQUAD4	20505	2	10505	10506	10606	10605			
520-	CQUAD4	20506	2	10506	10507	10607	10606			
521-	CQUAD4	20507	2	10507	10508	10608	10607			
522-	CQUAD4	20508	2	10508	10509	10609	10608			
523-	CQUAD4	20509	2	10509	10510	10610	10609			
524-	CQUAD4	20510	2	10510	10511	10611	10610			
525-	CQUAD4	20511	2	10511	10512	10612	10611			
526-	CQUAD4	20512	2	10512	10513	10613	10612			
527-	CQUAD4	20601	2	10601	10602	10702	10701			
528-	CQUAD4	20602	2	10602	10603	10703	10702			
529-	CQUAD4	20603	2	10603	10604	10704	10703			
530-	CQUAD4	20604	2	10604	10605	10705	10704			
531-	CQUAD4	20605	2	10605	10606	10706	10705			
532-	CQUAD4	20606	2	10606	10607	10707	10706			
533-	CQUAD4	20607	2	10607	10608	10708	10707			
534-	CQUAD4	20608	2	10608	10609	10709	10708			
535-	CQUAD4	20609	2	10609	10610	10710	10709			
536-	CQUAD4	20610	2	10610	10611	10711	10710			
537-	CQUAD4	20611	2	10611	10612	10712	10711			
538-	CQUAD4	20612	2	10612	10613	10713	10712			
539-	CQUAD4	20701	2	10701	10702	10802	10801			
540-	CQUAD4	20702	2	10702	10703	10803	10802			
541-	CQUAD4	20703	2	10703	10704	10804	10803			
542-	CQUAD4	20704	2	10704	10705	10805	10804			
543-	CQUAD4	20705	2	10705	10706	10806	10805			
544-	CQUAD4	20706	2	10706	10707	10807	10806			
545-	CQUAD4	20707	2	10707	10708	10808	10807			
546-	CQUAD4	20708	2	10708	10709	10809	10808			
547-	CQUAD4	20709	2	10709	10710	10810	10809			
548-	CQUAD4	20710	2	10710	10711	10811	10810			
549-	CQUAD4	20711	2	10711	10712	10812	10811			
550-	CQUAD4	20712	2	10712	10713	10813	10812			

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 14
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
551-	CQUAD4	20801	2	10801	10802	10902	10901			
552-	CQUAD4	20802	2	10802	10803	10903	10902			
553-	CQUAD4	20803	2	10803	10804	10904	10903			
554-	CQUAD4	20804	2	10804	10805	10905	10904			
555-	CQUAD4	20805	2	10805	10806	10906	10905			
556-	CQUAD4	20806	2	10806	10807	10907	10906			
557-	CQUAD4	20807	2	10807	10808	10908	10907			
558-	CQUAD4	20808	2	10808	10809	10909	10908			
559-	CQUAD4	20809	2	10809	10810	10910	10909			
560-	CQUAD4	20810	2	10810	10811	10911	10910			
561-	CQUAD4	20811	2	10811	10812	10912	10911			
562-	CQUAD4	20812	2	10812	10813	10913	10912			
563-	CQUAD4	20901	2	10901	10902	11002	11001			
564-	CQUAD4	20902	2	10902	10903	11003	11002			
565-	CQUAD4	20903	2	10903	10904	11004	11003			
566-	CQUAD4	20904	2	10904	10905	11005	11004			
567-	CQUAD4	20905	2	10905	10906	11006	11005			
568-	CQUAD4	20906	2	10906	10907	11007	11006			
569-	CQUAD4	20907	2	10907	10908	11008	11007			
570-	CQUAD4	20908	2	10908	10909	11009	11008			
571-	CQUAD4	20909	2	10909	10910	11010	11009			
572-	CQUAD4	20910	2	10910	10911	11011	11010			
573-	CQUAD4	20911	2	10911	10912	11012	11011			
574-	CQUAD4	20912	2	10912	10913	11013	11012			
575-	CQUAD4	21001	2	11001	11002	11102	11101			
576-	CQUAD4	21002	2	11002	11003	11103	11102			
577-	CQUAD4	21003	2	11003	11004	11104	11103			
578-	CQUAD4	21004	2	11004	11005	11105	11104			
579-	CQUAD4	21005	2	11005	11006	11106	11105			
580-	CQUAD4	21006	2	11006	11007	11107	11106			
581-	CQUAD4	21007	2	11007	11008	11108	11107			
582-	CQUAD4	21008	2	11008	11009	11109	11108			
583-	CQUAD4	21009	2	11009	11010	11110	11109			
584-	CQUAD4	21010	2	11010	11011	11111	11110			
585-	CQUAD4	21011	2	11011	11012	11112	11111			
586-	CQUAD4	21012	2	11012	11013	11113	11112			
587-	CQUAD4	21101	2	11101	11102	11202	11201			
588-	CQUAD4	21102	2	11102	11103	11203	11202			
589-	CQUAD4	21103	2	11103	11104	11204	11203			
590-	CQUAD4	21104	2	11104	11105	11205	11204			
591-	CQUAD4	21105	2	11105	11106	11206	11205			
592-	CQUAD4	21106	2	11106	11107	11207	11206			
593-	CQUAD4	21107	2	11107	11108	11208	11207			
594-	CQUAD4	21108	2	11108	11109	11209	11208			
595-	CQUAD4	21109	2	11109	11110	11210	11209			
596-	CQUAD4	21110	2	11110	11111	11211	11210			
597-	CQUAD4	21111	2	11111	11112	11212	11211			
598-	CQUAD4	21112	2	11112	11113	11213	11212			
599-	EIGR	77	GIV				20		10.E-10	+EIGR
600-	+EIGR	MAX								

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE          JANUARY  10, 1983   NASTRAN 12/14/81    PAGE    15
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5    ****
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S O R T E D   B U L K   D A T A   E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
601-	GRID	1		0.0000	-.91667	.00225		6		
602-	GRID	2		0.0000	0.00000	.00225		6		
603-	GRID	3		0.0000	.91667	.00225		6		
604-	GRID	4		0.0000	1.83333	.00225		6		
605-	GRID	5		0.0000	2.75000	.00225		6		
606-	GRID	6		0.0000	3.66667	.00225		6		
607-	GRID	7		0.0000	4.58333	.00225		6		
608-	GRID	8		0.0000	5.50000	.00225		6		
609-	GRID	9		0.0000	6.41667	.00225		6		
610-	GRID	10		0.0000	7.33333	.00225		6		
611-	GRID	11		0.0000	8.25000	.00225		6		
612-	GRID	12		0.0000	9.16667	.00225		6		
613-	GRID	13		0.0000	10.08333	.00225		6		
614-	GRID	101		.8333	-.91667	.00225		6		
615-	GRID	102		.8333	0.00000	.00225		6		
616-	GRID	103		.8333	.91667	.00225		6		
617-	GRID	104		.8333	1.83333	.00225		6		
618-	GRID	105		.8333	2.75000	.00225		6		
619-	GRID	106		.8333	3.66667	.00225		6		
620-	GRID	107		.8333	4.58333	.00225		6		
621-	GRID	108		.8333	5.50000	.00225		6		
622-	GRID	109		.8333	6.41667	.00225		6		
623-	GRID	110		.8333	7.33333	.00225		6		
624-	GRID	111		.8333	8.25000	.00225		6		
625-	GRID	112		.8333	9.16667	.00225		6		
626-	GRID	113		.8333	10.08333	.00225		6		
627-	GRID	201		1.6667	-.91667	.00225		6		
628-	GRID	202		1.6667	0.00000	.00225		6		
629-	GRID	203		1.6667	.91667	.00225		6		
630-	GRID	204		1.6667	1.83333	.00225		6		
631-	GRID	205		1.6667	2.75000	.00225		6		
632-	GRID	206		1.6667	3.66667	.00225		6		
633-	GRID	207		1.6667	4.58333	.00225		6		
634-	GRID	208		1.6667	5.50000	.00225		6		
635-	GRID	209		1.6667	6.41667	.00225		6		
636-	GRID	210		1.6667	7.33333	.00225		6		
637-	GRID	211		1.6667	8.25000	.00225		6		
638-	GRID	212		1.6667	9.16667	.00225		6		
639-	GRID	213		1.6667	10.08333	.00225		6		
640-	GRID	301		2.5000	-.91667	.00225		6		
641-	GRID	302		2.5000	0.00000	.00225		6		
642-	GRID	303		2.5000	.91667	.00225		6		
643-	GRID	304		2.5000	1.83333	.00225		6		
644-	GRID	305		2.5000	2.75000	.00225		6		
645-	GRID	306		2.5000	3.66667	.00225		6		
646-	GRID	307		2.5000	4.58333	.00225		6		
647-	GRID	308		2.5000	5.50000	.00225		6		
648-	GRID	309		2.5000	6.41667	.00225		6		
649-	GRID	310		2.5000	7.33333	.00225		6		
650-	GRID	311		2.5000	8.25000	.00225		6		

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 16
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
651-	GRID	312		2.5000	9.16667	.00225		6		
652-	GRID	313		2.5000	10.08333	.00225		6		
653-	GRID	401		3.3333	-.91667	.00225		6		
654-	GRID	402		3.3333	0.00000	.00225		6		
655-	GRID	403		3.3333	.91667	.00225		6		
656-	GRID	404		3.3333	1.83333	.00225		6		
657-	GRID	405		3.3333	2.75000	.00225		6		
658-	GRID	406		3.3333	3.66667	.00225		6		
659-	GRID	407		3.3333	4.58333	.00225		6		
660-	GRID	408		3.3333	5.50000	.00225		6		
661-	GRID	409		3.3333	6.41667	.00225		6		
662-	GRID	410		3.3333	7.33333	.00225		6		
663-	GRID	411		3.3333	8.25000	.00225		6		
664-	GRID	412		3.3333	9.16667	.00225		6		
665-	GRID	413		3.3333	10.08333	.00225		6		
666-	GRID	501		4.1667	-.91667	.00225		6		
667-	GRID	502		4.1667	0.00000	.00225		6		
668-	GRID	503		4.1667	.91667	.00225		6		
669-	GRID	504		4.1667	1.83333	.00225		6		
670-	GRID	505		4.1667	2.75000	.00225		6		
671-	GRID	506		4.1667	3.66667	.00225		6		
672-	GRID	507		4.1667	4.58333	.00225		6		
673-	GRID	508		4.1667	5.50000	.00225		6		
674-	GRID	509		4.1667	6.41667	.00225		6		
675-	GRID	510		4.1667	7.33333	.00225		6		
676-	GRID	511		4.1667	8.25000	.00225		6		
677-	GRID	512		4.1667	9.16667	.00225		6		
678-	GRID	513		4.1667	10.08333	.00225		6		
679-	GRID	601		5.0000	-.91667	.00225		6		
680-	GRID	602		5.0000	0.00000	.00225		6		
681-	GRID	603		5.0000	.91667	.00225		6		
682-	GRID	604		5.0000	1.83333	.00225		6		
683-	GRID	605		5.0000	2.75000	.00225		6		
684-	GRID	606		5.0000	3.66667	.00225		6		
685-	GRID	607		5.0000	4.58333	.00225		6		
686-	GRID	608		5.0000	5.50000	.00225		6		
687-	GRID	609		5.0000	6.41667	.00225		6		
688-	GRID	610		5.0000	7.33333	.00225		6		
689-	GRID	611		5.0000	8.25000	.00225		6		
690-	GRID	612		5.0000	9.16667	.00225		6		
691-	GRID	613		5.0000	10.08333	.00225		6		
692-	GRID	701		5.8333	-.91667	.00225		6		
693-	GRID	702		5.8333	0.00000	.00225		6		
694-	GRID	703		5.8333	.91667	.00225		6		
695-	GRID	704		5.8333	1.83333	.00225		6		
696-	GRID	705		5.8333	2.75000	.00225		6		
697-	GRID	706		5.8333	3.66667	.00225		6		
698-	GRID	707		5.8333	4.58333	.00225		6		
699-	GRID	708		5.8333	5.50000	.00225		6		
700-	GRID	709		5.8333	6.41667	.00225		6		

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 17
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
701-	GRID	710		5.8333	7.33333	.00225	6			
702-	GRID	711		5.8333	8.25000	.00225	6			
703-	GRID	712		5.8333	9.16667	.00225	6			
704-	GRID	713		5.8333	10.08333	.00225	6			
705-	GRID	801		6.6667	-.91667	.00225	6			
706-	GRID	802		6.6667	0.00000	.00225	6			
707-	GRID	803		6.6667	.91667	.00225	6			
708-	GRID	804		6.6667	1.83333	.00225	6			
709-	GRID	805		6.6667	2.75000	.00225	6			
710-	GRID	806		6.6667	3.66667	.00225	6			
711-	GRID	807		6.6667	4.58333	.00225	6			
712-	GRID	808		6.6667	5.50000	.00225	6			
713-	GRID	809		6.6667	6.41667	.00225	6			
714-	GRID	810		6.6667	7.33333	.00225	6			
715-	GRID	811		6.6667	8.25000	.00225	6			
716-	GRID	812		6.6667	9.16667	.00225	6			
717-	GRID	813		6.6667	10.08333	.00225	6			
718-	GRID	901		7.5000	-.91667	.00225	6			
719-	GRID	902		7.5000	0.00000	.00225	6			
720-	GRID	903		7.5000	.91667	.00225	6			
721-	GRID	904		7.5000	1.83333	.00225	6			
722-	GRID	905		7.5000	2.75000	.00225	6			
723-	GRID	906		7.5000	3.66667	.00225	6			
724-	GRID	907		7.5000	4.58333	.00225	6			
725-	GRID	908		7.5000	5.50000	.00225	6			
726-	GRID	909		7.5000	6.41667	.00225	6			
727-	GRID	910		7.5000	7.33333	.00225	6			
728-	GRID	911		7.5000	8.25000	.00225	6			
729-	GRID	912		7.5000	9.16667	.00225	6			
730-	GRID	913		7.5000	10.08333	.00225	6			
731-	GRID	1001		8.3333	-.91667	.00225	6			
732-	GRID	1002		8.3333	0.00000	.00225	6			
733-	GRID	1003		8.3333	.91667	.00225	6			
734-	GRID	1004		8.3333	1.83333	.00225	6			
735-	GRID	1005		8.3333	2.75000	.00225	6			
736-	GRID	1006		8.3333	3.66667	.00225	6			
737-	GRID	1007		8.3333	4.58333	.00225	6			
738-	GRID	1008		8.3333	5.50000	.00225	6			
739-	GRID	1009		8.3333	6.41667	.00225	6			
740-	GRID	1010		8.3333	7.33333	.00225	6			
741-	GRID	1011		8.3333	8.25000	.00225	6			
742-	GRID	1012		8.3333	9.16667	.00225	6			
743-	GRID	1013		8.3333	10.08333	.00225	6			
744-	GRID	1101		9.1667	-.91667	.00225	6			
745-	GRID	1102		9.1667	0.00000	.00225	6			
746-	GRID	1103		9.1667	.91667	.00225	6			
747-	GRID	1104		9.1667	1.83333	.00225	6			
748-	GRID	1105		9.1667	2.75000	.00225	6			
749-	GRID	1106		9.1667	3.66667	.00225	6			
750-	GRID	1107		9.1667	4.58333	.00225	6			

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 18
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3,5 ****

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
751-	GRID	1108		9,1667	5,50000	,00225	6			
752-	GRID	1109		9,1667	6,41667	,00225	6			
753-	GRID	1110		9,1667	7,33333	,00225	6			
754-	GRID	1111		9,1667	8,25000	,00225	6			
755-	GRID	1112		9,1667	9,16667	,00225	6			
756-	GRID	1113		9,1667	10,08333	,00225	6			
757-	GRID	1201		10,0000	-,91667	,00225	6			
758-	GRID	1202		10,0000	0,00000	,00225	6			
759-	GRID	1203		10,0000	,91667	,00225	6			
760-	GRID	1204		10,0000	1,83333	,00225	6			
761-	GRID	1205		10,0000	2,75000	,00225	6			
762-	GRID	1206		10,0000	3,66667	,00225	6			
763-	GRID	1207		10,0000	4,58333	,00225	6			
764-	GRID	1208		10,0000	5,50000	,00225	6			
765-	GRID	1209		10,0000	6,41667	,00225	6			
766-	GRID	1210		10,0000	7,33333	,00225	6			
767-	GRID	1211		10,0000	8,25000	,00225	6			
768-	GRID	1212		10,0000	9,16667	,00225	6			
769-	GRID	1213		10,0000	10,08333	,00225	6			
770-	GRID	10001		0,0000	-,91667	-,00225	6			
771-	GRID	10002		0,0000	0,00000	-,00225	6			
772-	GRID	10003		0,0000	,91667	-,00225	6			
773-	GRID	10004		0,0000	1,83333	-,00225	6			
774-	GRID	10005		0,0000	2,75000	-,00225	6			
775-	GRID	10006		0,0000	3,66667	-,00225	6			
776-	GRID	10007		0,0000	4,58333	-,00225	6			
777-	GRID	10008		0,0000	5,50000	-,00225	6			
778-	GRID	10009		0,0000	6,41667	-,00225	6			
779-	GRID	10010		0,0000	7,33333	-,00225	6			
780-	GRID	10011		0,0000	8,25000	-,00225	6			
781-	GRID	10012		0,0000	9,16667	-,00225	6			
782-	GRID	10013		0,0000	10,08333	-,00225	6			
783-	GRID	10101		,8333	-,91667	-,00225	6			
784-	GRID	10102		,8333	0,00000	-,00225	6			
785-	GRID	10103		,8333	,91667	-,00225	6			
786-	GRID	10104		,8333	1,83333	-,00225	6			
787-	GRID	10105		,8333	2,75000	-,00225	6			
788-	GRID	10106		,8333	3,66667	-,00225	6			
789-	GRID	10107		,8333	4,58333	-,00225	6			
790-	GRID	10108		,8333	5,50000	-,00225	6			
791-	GRID	10109		,8333	6,41667	-,00225	6			
792-	GRID	10110		,8333	7,33333	-,00225	6			
793-	GRID	10111		,8333	8,25000	-,00225	6			
794-	GRID	10112		,8333	9,16667	-,00225	6			
795-	GRID	10113		,8333	10,08333	-,00225	6			
796-	GRID	10201		1,6667	-,91667	-,00225	6			
797-	GRID	10202		1,6667	0,00000	-,00225	6			
798-	GRID	10203		1,6667	,91667	-,00225	6			
799-	GRID	10204		1,6667	1,83333	-,00225	6			
800-	GRID	10205		1,6667	2,75000	-,00225	6			

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 19

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
801-	GRID	10206		1.6667	3.66667	-.00225		6		
802-	GRID	10207		1.6667	4.58333	-.00225		6		
803-	GRID	10208		1.6667	5.50000	-.00225		6		
804-	GRID	10209		1.6667	6.41667	-.00225		6		
805-	GRID	10210		1.6667	7.33333	-.00225		6		
806-	GRID	10211		1.6667	8.25000	-.00225		6		
807-	GRID	10212		1.6667	9.16667	-.00225		6		
808-	GRID	10213		1.6667	10.08333	-.00225		6		
809-	GRID	10301		2.5000	-.91667	-.00225		6		
810-	GRID	10302		2.5000	0.00000	-.00225		6		
811-	GRID	10303		2.5000	.91667	-.00225		6		
812-	GRID	10304		2.5000	1.83333	-.00225		6		
813-	GRID	10305		2.5000	2.75000	-.00225		6		
814-	GRID	10306		2.5000	3.66667	-.00225		6		
815-	GRID	10307		2.5000	4.58333	-.00225		6		
816-	GRID	10308		2.5000	5.50000	-.00225		6		
817-	GRID	10309		2.5000	6.41667	-.00225		6		
818-	GRID	10310		2.5000	7.33333	-.00225		6		
819-	GRID	10311		2.5000	8.25000	-.00225		6		
820-	GRID	10312		2.5000	9.16667	-.00225		6		
821-	GRID	10313		2.5000	10.08333	-.00225		6		
822-	GRID	10401		3.3333	-.91667	-.00225		6		
823-	GRID	10402		3.3333	0.00000	-.00225		6		
824-	GRID	10403		3.3333	.91667	-.00225		6		
825-	GRID	10404		3.3333	1.83333	-.00225		6		
826-	GRID	10405		3.3333	2.75000	-.00225		6		
827-	GRID	10406		3.3333	3.66667	-.00225		6		
828-	GRID	10407		3.3333	4.58333	-.00225		6		
829-	GRID	10408		3.3333	5.50000	-.00225		6		
830-	GRID	10409		3.3333	6.41667	-.00225		6		
831-	GRID	10410		3.3333	7.33333	-.00225		6		
832-	GRID	10411		3.3333	8.25000	-.00225		6		
833-	GRID	10412		3.3333	9.16667	-.00225		6		
834-	GRID	10413		3.3333	10.08333	-.00225		6		
835-	GRID	10501		4.1667	-.91667	-.00225		6		
836-	GRID	10502		4.1667	0.00000	-.00225		6		
837-	GRID	10503		4.1667	.91667	-.00225		6		
838-	GRID	10504		4.1667	1.83333	-.00225		6		
839-	GRID	10505		4.1667	2.75000	-.00225		6		
840-	GRID	10506		4.1667	3.66667	-.00225		6		
841-	GRID	10507		4.1667	4.58333	-.00225		6		
842-	GRID	10508		4.1667	5.50000	-.00225		6		
843-	GRID	10509		4.1667	6.41667	-.00225		6		
844-	GRID	10510		4.1667	7.33333	-.00225		6		
845-	GRID	10511		4.1667	8.25000	-.00225		6		
846-	GRID	10512		4.1667	9.16667	-.00225		6		
847-	GRID	10513		4.1667	10.08333	-.00225		6		
848-	GRID	10601		5.0000	-.91667	-.00225		6		
849-	GRID	10602		5.0000	0.00000	-.00225		6		
850-	GRID	10603		5.0000	.91667	-.00225		6		

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE — JANUARY 10, 1983 — NASTRAN 12/14/81 — PAGE 20
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

S O R T E D   B U L K   D A T A   E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
851-	GRID	10604		5.0000	1.83333	-.00225		6		
852-	GRID	10605		5.0000	2.75000	-.00225		6		
853-	GRID	10606		5.0000	3.66667	-.00225		6		
854-	GRID	10607		5.0000	4.58333	-.00225		6		
855-	GRID	10608		5.0000	5.50000	-.00225		6		
856-	GRID	10609		5.0000	6.41667	-.00225		6		
857-	GRID	10610		5.0000	7.33333	-.00225		6		
858-	GRID	10611		5.0000	8.25000	-.00225		6		
859-	GRID	10612		5.0000	9.16667	-.00225		6		
860-	GRID	10613		5.0000	10.08333	-.00225		6		
861-	GRID	10701		5.8333	-.91667	-.00225		6		
862-	GRID	10702		5.8333	0.00000	-.00225		6		
863-	GRID	10703		5.8333	.91667	-.00225		6		
864-	GRID	10704		5.8333	1.83333	-.00225		6		
865-	GRID	10705		5.8333	2.75000	-.00225		6		
866-	GRID	10706		5.8333	3.66667	-.00225		6		
867-	GRID	10707		5.8333	4.58333	-.00225		6		
868-	GRID	10708		5.8333	5.50000	-.00225		6		
869-	GRID	10709		5.8333	6.41667	-.00225		6		
870-	GRID	10710		5.8333	7.33333	-.00225		6		
871-	GRID	10711		5.8333	8.25000	-.00225		6		
872-	GRID	10712		5.8333	9.16667	-.00225		6		
873-	GRID	10713		5.8333	10.08333	-.00225		6		
874-	GRID	10801		6.6667	-.91667	-.00225		6		
875-	GRID	10802		6.6667	0.00000	-.00225		6		
876-	GRID	10803		6.6667	.91667	-.00225		6		
877-	GRID	10804		6.6667	1.83333	-.00225		6		
878-	GRID	10805		6.6667	2.75000	-.00225		6		
879-	GRID	10806		6.6667	3.66667	-.00225		6		
880-	GRID	10807		6.6667	4.58333	-.00225		6		
881-	GRID	10808		6.6667	5.50000	-.00225		6		
882-	GRID	10809		6.6667	6.41667	-.00225		6		
883-	GRID	10810		6.6667	7.33333	-.00225		6		
884-	GRID	10811		6.6667	8.25000	-.00225		6		
885-	GRID	10812		6.6667	9.16667	-.00225		6		
886-	GRID	10813		6.6667	10.08333	-.00225		6		
887-	GRID	10901		7.5000	-.91667	-.00225		6		
888-	GRID	10902		7.5000	0.00000	-.00225		6		
889-	GRID	10903		7.5000	.91667	-.00225		6		
890-	GRID	10904		7.5000	1.83333	-.00225		6		
891-	GRID	10905		7.5000	2.75000	-.00225		6		
892-	GRID	10906		7.5000	3.66667	-.00225		6		
893-	GRID	10907		7.5000	4.58333	-.00225		6		
894-	GRID	10908		7.5000	5.50000	-.00225		6		
895-	GRID	10909		7.5000	6.41667	-.00225		6		
896-	GRID	10910		7.5000	7.33333	-.00225		6		
897-	GRID	10911		7.5000	8.25000	-.00225		6		
898-	GRID	10912		7.5000	9.16667	-.00225		6		
899-	GRID	10913		7.5000	10.08333	-.00225		6		
900-	GRID	11001		8.3333	-.91667	-.00225		6		

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE            JANUARY  10, 1983   NASTRAN 12/14/81    PAGE    21
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****

                          -   S O R T E D   B U L K   D A T A   E C H O
       CARD
       COUNT      .  1  ..  2  ..  3  ..  4  ..  5  ..  6  ..  7  ..  8  ..  9  ..  10  .
        901-      GRID    11002           8.3333  0.00000 -.00225       6
        902-      GRID    11003           8.3333  .91667  -.00225       6
        903-      GRID    11004           8.3333  1.83333 -.00225       6
        904-      GRID    11005           8.3333  2.75000 -.00225       6
        905-      GRID    11006           8.3333  3.66667 -.00225       6
        906-      GRID    11007           8.3333  4.58333 -.00225       6
        907-      GRID    11008           8.3333  5.50000 -.00225       6
        908-      GRID    11009           8.3333  6.41667 -.00225       6
        909-      GRID    11010           8.3333  7.33333 -.00225       6
        910-      GRID    11011           8.3333  8.25000 -.00225       6
        911-      GRID    11012           8.3333  9.16667 -.00225       6
        912-      GRID    11013           8.3333  10.08333-.00225       6
        913-      GRID    11101           9.1667  -.91667 -.00225       6
        914-      GRID    11102           9.1667  0.00000 -.00225       6
        915-      GRID    11103           9.1667  .91667  -.00225       6
        916-      GRID    11104           9.1667  1.83333 -.00225       6
        917-      GRID    11105           9.1667  2.75000 -.00225       6
        918-      GRID    11106           9.1667  3.66667 -.00225       6
        919-      GRID    11107           9.1667  4.58333 -.00225       6
        920-      GRID    11108           9.1667  5.50000 -.00225       6
        921-      GRID    11109           9.1667  6.41667 -.00225       6
        922-      GRID    11110           9.1667  7.33333 -.00225       6
        923-      GRID    11111           9.1667  8.25000 -.00225       6
        924-      GRID    11112           9.1667  9.16667 -.00225       6
        925-      GRID    11113           9.1667  10.08333-.00225       6
        926-      GRID    11201           10.0000 -.91667 -.00225       6
        927-      GRID    11202           10.0000 0.00000 -.00225       6
        928-      GRID    11203           10.0000 .91667  -.00225       6
        929-      GRID    11204           10.0000 1.83333 -.00225       6
        930-      GRID    11205           10.0000 2.75000 -.00225       6
        931-      GRID    11206           10.0000 3.66667 -.00225       6
        932-      GRID    11207           10.0000 4.58333 -.00225       6
        933-      GRID    11208           10.0000 5.50000 -.00225       6
        934-      GRID    11209           10.0000 6.41667 -.00225       6
        935-      GRID    11210           10.0000 7.33333 -.00225       6
        936-      GRID    11211           10.0000 8.25000 -.00225       6
        937-      GRID    11212           10.0000 9.16667 -.00225       6
        938-      GRID    11213           10.0000 10.08333-.00225       6
        939-      MAT1    1       .10E+08         .3000   .10000
        940-      MAT1    2       .10E+08         .3000   .10000
        941-      MAT1    3               .450E+03.4999   .03500
        942-      MAT1    41      .50E+07         .3000   .10000
        943-      MAT1    42      -.50E+07        .3000   .10000
        944-      PARAM   GRDPNT  0
        945-      PARAM   NEWSEQ  3
        946-      PARAM   TINY    .1
        947-      PARAM   WTMASS  .002588
        948-      PSHELL  1       1       .0550   1       4.00000 1       .8333333        +PQ     1
        949-      +PQ     1               41
        950-      PSHELL  2       2       .0550   2       4.00000 2       .8333333        +PQ     2
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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE          JANUARY  10, 1983   NASTRAN 12/14/81    PAGE    22
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****

                                      S O R T E D   B U L K   D A T A   E C H O
        CARD
        COUNT       .  1  ..  2  ..  3  ..  4  ..  5  ..  6  ..  7  ..  8  ..  9  ..  10  .
         951-       +PQ     2               42
         952-       PSOLID  3       3
         953-       SPC1    1       13      101     201     301     401     501     601
         954-       SPC1    1       13      113     213     313     413     513     613
         955-       SPC1    1       13      701     801     901     1001    1101
         956-       SPC1    1       13      713     813     913     1013    1113
         957-       SPC1    1       13      10013   10113   10213   10313   10413   10513
         958-       SPC1    1       13      10101   10201   10301   10401   10501   10601
         959-       SPC1    1       13      10701   10801   10901   11001   11101
         960-       SPC1    1       13      10713   10813   10913   11013   11113
         961-       SPC1    1       23      1       THRU    13
         962-       SPC1    1       23      1201    THRU    1213
         963-       SPC1    1       23      10001   THRU    10013
         964-       SPC1    1       23      11201   THRU    11213
                    ENDDATA

                 TOTAL COUNT=   965

*** USER WARNING MESSAGE 2251A, ONE OR MORE MAT1 CARDS HAVE UNREASONABLE OR INCONSISTENT VALUES OF E,G OR NU.
ID OF FIRST ONE =        42

*** USER WARNING MESSAGE 2251B, THE NUMBER OF MAT1 CARDS HAVING UNREASONABLE OR INCONSISTENT VALUES FOR E,G AND/OR NU IS        1
ID OF LAST ONE =        42
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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983   NASTRAN 12/14/81   PAGE 26
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

R E A L   E I G E N V A L U E S

MODE NO.	EXTRACTION ORDER	EIGENVALUE	RADIANS	CYCLES	GENERALIZED MASS	GENERALIZED STIFFNESS
1	131	1.099561E+06	1.048600E+03	1.668898E+02	7.938945E-04	8.729356E+02
2	132	4.744975E+06	2.178296E+03	3.466866E+02	8.439574E-04	4.004556E+03
3	133	5.747225E+06	2.397337E+03	3.815480E+02	8.430799E-04	4.845370E+03
4	134	1.127080E+07	3.357201E+03	5.343151E+02	7.762886E-04	8.749392E+03
5	135	1.449947E+07	3.807816E+03	6.060328E+02	7.740813E-04	1.122376E+04
6	136	1.871938E+07	4.326590E+03	6.885981E+02	7.663508E-04	1.434561E+04
7	137	2.376467E+07	4.874902E+03	7.758648E+02	1.008836E-03	2.397466E+04
8	138	2.692371E+07	5.188806E+03	8.258241E+02	9.844302E-04	2.650451E+04
9	139	3.606837E+07	6.005695E+03	9.558360E+02	8.904128E-04	3.211574E+04
10	141	4.334321E+07	6.583556E+03	1.047805E+03	7.771628E-04	3.368473E+04
11	143	4.843452E+07	6.959491E+03	1.107637E+03	8.765702E-04	4.245626E+04
12	142	5.065117E+07	7.116963E+03	1.132700E+03	9.138648E-04	4.628832E+04
13	140	6.246809E+07	7.903676E+03	1.257909E+03	8.964685E-04	5.600067E+04
14	146	7.711511E+07	8.781521E+03	1.397622E+03	7.376173E-04	5.688144E+04
15	145	7.727515E+07	8.790628E+03	1.399072E+03	8.578710E-04	6.629210E+04
16	144	8.491025E+07	9.214676E+03	1.466561E+03	7.240662E-04	6.148064E+04
17	130	1.008468E+08	1.004225E+04	1.598274E+03	6.498899E-04	6.553929E+04
18	129	1.066431E+08	1.032682E+04	1.643564E+03	7.008227E-04	7.473792E+04
19	128	1.307702E+08	1.143548E+04	1.820013E+03	6.205890E-04	8.115455E+04
20	127	1.388329E+08	1.178274E+04	1.875281E+03	5.444824E-04	7.559209E+04
21	126	1.435232E+08	1.198012E+04	1.906695E+03	0.0	0.0
22	125	1.452472E+08	1.205185E+04	1.918112E+03	0.0	0.0
23	124	1.649662E+08	1.284392E+04	2.044173E+03	0.0	0.0
24	123	1.753908E+08	1.324352E+04	2.107771E+03	0.0	0.0
25	122	2.044341E+08	1.429805E+04	2.275605E+03	0.0	0.0
26	119	2.307806E+08	1.519146E+04	2.417796E+03	0.0	0.0
27	120	2.345998E+08	1.531665E+04	2.437721E+03	0.0	0.0
28	121	2.347524E+08	1.532163E+04	2.438513E+03	0.0	0.0
29	118	2.512634E+08	1.585129E+04	2.522811E+03	0.0	0.0
30	117	2.931706E+08	1.712223E+04	2.725087E+03	0.0	0.0
31	116	3.070612E+08	1.752316E+04	2.788898E+03	0.0	0.0
32	115	3.394016E+08	1.842286E+04	2.932089E+03	0.0	0.0
33	114	3.734244E+08	1.932419E+04	3.075541E+03	0.0	0.0
34	113	3.914594E+08	1.978533E+04	3.148934E+03	0.0	0.0
35	112	4.232624E+08	2.057334E+04	3.274349E+03	0.0	0.0
36	111	4.505560E+08	2.122631E+04	3.378271E+03	0.0	0.0
37	110	4.989128E+08	2.233636E+04	3.554941E+03	0.0	0.0
38	108	5.256740E+08	2.292758E+04	3.649038E+03	0.0	0.0
39	109	5.273597E+08	2.296431E+04	3.654884E+03	0.0	0.0
40	107	5.721795E+08	2.392027E+04	3.807030E+03	0.0	0.0
41	106	6.056311E+08	2.460957E+04	3.916735E+03	0.0	0.0
42	105	6.415122E+08	2.532809E+04	4.031091E+03	0.0	0.0
43	104	6.476668E+08	2.544930E+04	4.050382E+03	0.0	0.0
44	103	6.783481E+08	2.604512E+04	4.145209E+03	0.0	0.0
45	102	8.231278E+08	2.869020E+04	4.566188E+03	0.0	0.0
46	101	9.702058E+08	3.114813E+04	4.957378E+03	0.0	0.0
47	100	9.883113E+08	3.143742E+04	5.003420E+03	0.0	0.0
48	99	1.038439E+09	3.222482E+04	5.128739E+03	0.0	0.0
49	98	1.246920E+09	3.531175E+04	5.620039E+03	0.0	0.0
50	97	1.351368E+09	3.676096E+04	5.850688E+03	0.0	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 30
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1
EIGENVALUE = 1,099561E+06
CYCLES = 1,668898E+02 R E A L E I G E N V E C T O R N O . 1

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	-1,547001E-03	0,0	0,0	1,825713E-03	6,318799E-03	0,0
2	G	6,676538E-04	0,0	0,0	3,910256E-03	-8,128915E-02	0,0
3	G	1,267013E-03	0,0	0,0	2,763311E-03	-1,576274E-01	0,0
4	G	1,858750E-03	0,0	0,0	2,592724E-03	-2,229523E-01	0,0
5	G	2,244576E-03	0,0	0,0	1,672987E-03	-2,717284E-01	0,0
6	G	2,526960E-03	0,0	0,0	8,995360E-04	-3,038294E-01	0,0
7	G	2,595930E-03	0,0	0,0	-4,645344E-06	-3,138546E-01	0,0
8	G	2,518499E-03	0,0	0,0	-9,162009E-04	-3,037088E-01	0,0
9	G	2,226475E-03	0,0	0,0	-1,680280E-03	-2,714859E-01	0,0
10	G	1,828763E-03	0,0	0,0	-2,616437E-03	-2,225720E-01	0,0
11	G	1,219551E-03	0,0	0,0	-2,758885E-03	-1,570897E-01	0,0
12	G	6,060539E-04	0,0	0,0	-3,960528E-03	-8,058940E-02	0,0
13	G	-1,637275E-03	0,0	0,0	-1,824089E-03	6,795974E-03	0,0
101	G	0,0	4,665938E-04	0,0	7,552298E-02	-9,018473E-03	0,0
102	G	4,901315E-04	4,013783E-04	6,758689E-02	7,252496E-02	-8,045279E-02	0,0
103	G	1,242266E-03	4,808344E-04	1,300780E-01	6,500507E-02	-1,522379E-01	0,0
104	G	1,742766E-03	3,854025E-04	1,835236E-01	5,213769E-02	-2,138766E-01	0,0
105	G	2,139075E-03	2,915139E-04	2,240453E-01	3,730849E-02	-2,615336E-01	0,0
106	G	2,383772E-03	1,661607E-04	2,501946E-01	1,970049E-02	-2,916040E-01	0,0
107	G	2,488784E-03	7,153849E-06	2,589943E-01	-5,800336E-05	-3,025832E-01	0,0
108	G	2,375287E-03	-1,504501E-04	2,501011E-01	-1,979143E-02	-2,915043E-01	0,0
109	G	2,121267E-03	-2,738876E-04	2,238615E-01	-3,742277E-02	-2,613429E-01	0,0
110	G	1,713847E-03	-3,617270E-04	1,832546E-01	-5,220298E-02	-2,136218E-01	0,0
111	G	1,202339E-03	-4,488596E-04	1,297536E-01	-6,506540E-02	-1,520020E-01	0,0
112	G	4,380511E-04	-3,505370E-04	6,729529E-02	-7,235560E-02	-8,042090E-02	0,0
113	G	0,0	-4,115655E-04	0,0	-7,507182E-02	-9,393318E-03	0,0
201	G	0,0	1,152928E-03	0,0	1,435338E-01	6,794197E-05	0,0
202	G	4,604447E-04	1,083162E-03	1,300664E-01	1,381925E-01	-7,099239E-02	0,0
203	G	1,067618E-03	9,562974E-04	2,508948E-01	1,239397E-01	-1,362380E-01	0,0
204	G	1,595062E-03	7,757505E-04	3,542357E-01	9,965296E-02	-1,930384E-01	0,0
205	G	1,935600E-03	5,706195E-04	4,326223E-01	7,089197E-02	-2,352974E-01	0,0
206	G	2,178398E-03	3,309865E-04	4,830186E-01	3,774148E-02	-2,630344E-01	0,0
207	G	2,240616E-03	1,320383E-05	5,002110E-01	-8,874030E-05	-2,718416E-01	0,0
208	G	2,169642E-03	-3,032879E-04	4,828573E-01	-3,791064E-02	-2,629721E-01	0,0
209	G	1,917340E-03	-5,391978E-04	4,323134E-01	-7,104000E-02	-2,351868E-01	0,0
210	G	1,566454E-03	-7,375182E-04	3,538133E-01	-9,974364E-02	-1,929149E-01	0,0
211	G	1,028005E-03	-9,080068E-04	2,504465E-01	-1,238874E-01	-1,361470E-01	0,0
212	G	4,212492E-04	-1,030646E-03	1,297580E-01	-1,379199E-01	-7,095980E-02	0,0
213	G	0,0	-1,100118E-03	0,0	-1,431372E-01	2,024939E-04	0,0
301	G	0,0	1,708311E-03	0,0	2,029611E-01	-3,386991E-03	0,0
302	G	4,274639E-04	1,586102E-03	1,836854E-01	1,940459E-01	-5,747280E-02	0,0
303	G	8,424465E-04	1,449935E-03	3,543146E-01	1,754028E-01	-1,099852E-01	0,0
304	G	1,234126E-03	1,118907E-03	5,008532E-01	1,407165E-01	-1,554408E-01	0,0
305	G	1,537572E-03	8,226005E-04	6,117755E-01	1,002746E-01	-1,906889E-01	0,0
306	G	1,729923E-03	4,761364E-04	6,833401E-01	5,341771E-02	-2,131137E-01	0,0
307	G	1,813528E-03	1,693231E-05	7,076328E-01	-1,094434E-04	-2,214911E-01	0,0
308	G	1,721131E-03	-4,410506E-04	6,831437E-01	-5,361824E-02	-2,130924E-01	0,0
309	G	1,519667E-03	-7,847109E-04	6,114072E-01	-1,004415E-01	-1,906584E-01	0,0
310	G	1,207037E-03	-1,076482E-03	5,003697E-01	-1,407894E-01	-1,554210E-01	0,0
311	G	8,091173E-04	-1,405061E-03	3,538212E-01	-1,753381E-01	-1,099805E-01	0,0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 31
SIMPLY SUPPORTED CONFIG. ,055 IN FACE SHEETS, ,0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3,5 **** SUBCASE 1
EIGENVALUE = 1,099561E+06
CYCLES = 1,668898E+02 R E A L E I G E N V E C T O R N O . 1

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
312	G	4,018333E-04	-1,541005E-03	1,833453E-01	-1,937617E-01	-5,746285E-02	0,0
313	G	0,0	-1,662639E-03	0,0	-2,025212E-01	-3,469375E-03	0,0
401	G	0,0	2,064565E-03	0,0	2,472581E-01	-9,989431E-04	0,0
402	G	3,045891E-04	1,949732E-03	2,243124E-01	2,373899E-01	-4,084826E-02	0,0
403	G	6,119491E-04	1,779843E-03	4,329324E-01	2,139154E-01	-7,803930E-02	0,0
404	G	8,859026E-04	1,403661E-03	6,121512E-01	1,727636E-01	-1,105552E-01	0,0
405	G	1,094250E-03	1,012121E-03	7,484139E-01	1,227046E-01	-1,353691E-01	0,0
406	G	1,228784E-03	5,913254E-04	8,359721E-01	6,568113E-02	-1,511729E-01	0,0
407	G	1,271227E-03	1,846579E-05	8,660887E-01	-1,103881E-04	-1,562154E-01	0,0
408	G	1,220611E-03	-5,538115E-04	8,357733E-01	-6,588446E-02	-1,511855E-01	0,0
409	G	1,078206E-03	-9,731995E-04	7,480501E-01	-1,228526E-01	-1,354023E-01	0,0
410	G	8,635842E-04	-1,363632E-03	6,116945E-01	-1,728116E-01	-1,106213E-01	0,0
411	G	5,888016E-04	-1,739977E-03	4,324957E-01	-2,138122E-01	-7,814548E-02	0,0
412	G	2,897860E-04	-1,911117E-03	2,240401E-01	-2,371343E-01	-4,097408E-02	0,0
413	G	0,0	-2,026877E-03	0,0	-2,469360E-01	-9,735788E-04	0,0
501	G	0,0	2,325899E-03	0,0	2,763128E-01	-9,665939E-04	0,0
502	G	1,748506E-04	2,183002E-03	2,504606E-01	2,647264E-01	-2,165444E-02	0,0
503	G	3,456776E-04	2,001529E-03	4,833020E-01	2,389571E-01	-4,161467E-02	0,0
504	G	4,985666E-04	1,587467E-03	6,836689E-01	1,932122E-01	-5,887521E-02	0,0
505	G	6,248398E-04	1,139884E-03	8,360247E-01	1,370954E-01	-7,255319E-02	0,0
506	G	6,559364E-04	6,220292E-04	9,331739E-01	7,182510E-02	-7,932923E-02	0,0
507	G	6,539243E-04	1,807372E-05	9,659785E-01	-1,016036E-04	-8,119176E-02	0,0
508	G	6,488398E-04	-5,857207E-04	9,329931E-01	-7,200741E-02	-7,935847E-02	0,0
509	G	6,113821E-04	-1,103582E-03	8,356997E-01	-1,372208E-01	-7,261077E-02	0,0
510	G	4,809135E-04	-1,551704E-03	6,832730E-01	-1,932383E-01	-5,895426E-02	0,0
511	G	3,278098E-04	-1,967230E-03	4,829351E-01	-2,388607E-01	-4,168565E-02	0,0
512	G	1,625941E-04	-2,150505E-03	2,502346E-01	-2,645177E-01	-2,167133E-02	0,0
513	G	0,0	-2,293772E-03	0,0	-2,760444E-01	-9,909766E-04	0,0
601	G	0,0	2,390895E-03	0,0	2,854451E-01	-2,586690E-06	0,0
602	G	-3,106549E-06	2,285696E-03	2,593461E-01	2,748425E-01	-6,024066E-06	0,0
603	G	-6,189788E-06	2,063177E-03	5,006685E-01	2,469695E-01	-1,133319E-05	0,0
604	G	-9,292276E-06	1,667887E-03	7,081683E-01	2,008934E-01	-1,872005E-05	0,0
605	G	-1,243001E-05	1,180728E-03	8,664225E-01	1,417042E-01	-2,868798E-05	0,0
606	G	-1,557307E-05	6,210182E-04	9,662438E-01	7,348470E-02	-4,217533E-05	0,0
607	G	-1,861984E-05	1,646783E-05	1,000000E+00	-8,559839E-05	-5,928945E-05	0,0
608	G	-2,126525E-05	-5,882736E-04	9,660916E-01	-7,363853E-02	-7,902367E-05	0,0
609	G	-2,285279E-05	-1,148553E-03	8,661523E-01	-1,418021E-01	-9,770092E-05	0,0
610	G	-2,229250E-05	-1,636966E-03	7,078464E-01	-2,009082E-01	-1,088973E-04	0,0
611	G	-1,821670E-05	-2,033791E-03	5,003768E-01	-2,468824E-01	-1,061737E-04	0,0
612	G	-1,010251E-05	-2,257954E-03	2,591719E-01	-2,746774E-01	-9,023759E-05	0,0
613	G	0,0	-2,363473E-03	0,0	-2,852431E-01	-2,627570E-06	0,0
701	G	0,0	2,325460E-03	0,0	2,763212E-01	9,606657E-04	0,0
702	G	-1,810337E-04	2,182501E-03	2,504687E-01	2,647354E-01	2,164419E-02	0,0
703	G	-3,579910E-04	2,000842E-03	4,833194E-01	2,389683E-01	4,159521E-02	0,0
704	G	-5,170238E-04	1,586404E-03	6,836983E-01	1,932267E-01	5,884299E-02	0,0
705	G	-6,494968E-04	1,138212E-03	8,360700E-01	1,371153E-01	7,250355E-02	0,0
706	G	-6,868116E-04	6,194144E-04	9,332407E-01	7,185131E-02	7,925601E-02	0,0
707	G	-6,908555E-04	1,413401E-05	9,660729E-01	-6,871124E-05	8,108808E-02	0,0
708	G	-6,911647E-04	-5,913840E-04	9,331196E-01	-7,197243E-02	7,921926E-02	0,0
709	G	-6,573192E-04	-1,110980E-03	8,358569E-01	-1,371911E-01	7,243748E-02	0,0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 32
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1
EIGENVALUE = 1.099561E+06
CYCLES = 1.668898E+02 R E A L E I G E N V E C T O R N O . 1

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
710	G	-5.265713E-04	-1.560410E-03	6.834475E-01	-1.932342E-01	5.876370E-02	0.0
711	G	-3.669187E-04	-1.976255E-03	4.830939E-01	-2.389009E-01	4.152742E-02	0.0
712	G	-1.869940E-04	-2.159132E-03	2.503335E-01	-2.646085E-01	2.161981E-02	0.0
713	G	0.0	-2.302370E-03	0.0	-2.761641E-01	9.526917E-04	0.0
801	G	0.0	2.063818E-03	0.0	2.472726E-01	9.948727E-04	0.0
802	G	-3.106894E-04	1.948886E-03	2.243264E-01	2.374055E-01	4.084153E-02	0.0
803	G	-6.240470E-04	1.778663E-03	4.329625E-01	2.139346E-01	7.802768E-02	0.0
804	G	-9.039824E-04	1.401831E-03	6.122020E-01	1.727889E-01	1.105362E-01	0.0
805	G	-1.118324E-03	1.009210E-03	7.484925E-01	1.227390E-01	1.353399E-01	0.0
806	G	-1.258859E-03	5.867555E-04	8.360884E-01	6.572753E-02	1.511292E-01	0.0
807	G	-1.307218E-03	1.147626E-05	8.662540E-01	-5.196644E-05	1.561521E-01	0.0
808	G	-1.262106E-03	-5.640435E-04	8.359971E-01	-6.581885E-02	1.510959E-01	0.0
809	G	-1.124077E-03	-9.872133E-04	7.483326E-01	-1.227949E-01	1.352807E-01	0.0
810	G	-9.108400E-04	-1.380874E-03	6.120155E-01	-1.727929E-01	1.104651E-01	0.0
811	G	-6.301434E-04	-1.758815E-03	4.327559E-01	-2.138829E-01	7.796020E-02	0.0
812	G	-3.140706E-04	-1.929950E-03	2.242277E-01	-2.373111E-01	4.078888E-02	0.0
813	G	0.0	-2.045225E-03	0.0	-2.471605E-01	9.969358E-04	0.0
901	G	0.0	1.707477E-03	0.0	2.029780E-01	3.380461E-03	0.0
902	G	-4.334464E-04	1.585152E-03	1.837016E-01	1.940638E-01	5.747141E-02	0.0
903	G	-8.542831E-04	1.448627E-03	3.543496E-01	1.754252E-01	1.099848E-01	0.0
904	G	-1.251687E-03	1.116811E-03	5.009121E-01	1.407455E-01	1.554405E-01	0.0
905	G	-1.560840E-03	8.192387E-04	6.118667E-01	1.003153E-01	1.906884E-01	0.0
906	G	-1.758883E-03	4.707626E-04	6.834757E-01	5.347173E-02	2.131123E-01	0.0
907	G	-1.848137E-03	8.659502E-06	7.078271E-01	-3.725902E-05	2.214873E-01	0.0
908	G	-1.761300E-03	-4.536135E-04	6.834108E-01	-5.353657E-02	2.130830E-01	0.0
909	G	-1.565091E-03	-8.026458E-04	6.117534E-01	-1.003549E-01	1.906368E-01	0.0
910	G	-1.256714E-03	-1.100981E-03	5.007805E-01	-1.407478E-01	1.553805E-01	0.0
911	G	-8.587995E-04	-1.433619E-03	3.542322E-01	-1.753890E-01	1.099332E-01	0.0
912	G	-4.363274E-04	-1.570828E-03	1.836318E-01	-1.939978E-01	5.744918E-02	0.0
913	G	0.0	-1.693366E-03	0.0	-2.028986E-01	3.379522E-03	0.0
1001	G	0.0	1.152324E-03	0.0	1.435481E-01	-6.743782E-05	0.0
1002	G	-4.664617E-04	1.082468E-03	1.300804E-01	1.382077E-01	7.099691E-02	0.0
1003	G	-1.079164E-03	9.552638E-04	2.509251E-01	1.239587E-01	1.362488E-01	0.0
1004	G	-1.612075E-03	7.739626E-04	3.542868E-01	9.967816E-02	1.930570E-01	0.0
1005	G	-1.958040E-03	5.676887E-04	4.327016E-01	7.092710E-02	2.353261E-01	0.0
1006	G	-2.206184E-03	3.262710E-04	4.831369E-01	3.778979E-02	2.630765E-01	0.0
1007	G	-2.273695E-03	5.801254E-06	5.003818E-01	-2.410867E-05	2.719009E-01	0.0
1008	G	-2.208030E-03	-3.147865E-04	4.830956E-01	-3.783192E-02	2.630501E-01	0.0
1009	G	-1.961271E-03	-5.565645E-04	4.326295E-01	-7.095269E-02	2.352800E-01	0.0
1010	G	-1.615845E-03	-7.633372E-04	3.542034E-01	-9.967997E-02	1.930031E-01	0.0
1011	G	-1.082397E-03	-9.451339E-04	2.508509E-01	-1.239357E-01	1.361996E-01	0.0
1012	G	-4.681077E-04	-1.072762E-03	1.300365E-01	-1.381661E-01	7.096173E-02	0.0
1013	G	0.0	-1.142783E-03	0.0	-1.434990E-01	-6.705621E-05	0.0
1101	G	0.0	4.665335E-04	0.0	7.553130E-02	9.004786E-03	0.0
1102	G	-4.961147E-04	4.012570E-04	6.759502E-02	7.253193E-02	8.045866E-02	0.0
1103	G	-1.253500E-03	4.803046E-04	1.300955E-01	6.501604E-02	1.522564E-01	0.0
1104	G	-1.759359E-03	3.843542E-04	1.835533E-01	5.215016E-02	2.139088E-01	0.0
1105	G	-2.160881E-03	2.898750E-04	2.240913E-01	3.733077E-02	2.615837E-01	0.0
1106	G	-2.410654E-03	1.633222E-04	2.502636E-01	1.972557E-02	2.916789E-01	0.0
1107	G	-2.520659E-03	2.920311E-06	2.590946E-01	-1.290952E-05	3.026914E-01	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 33
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1
EIGENVALUE = 1.099561E+06
CYCLES = 1.668898E+02 R E A L E I G E N V E C T O R N O . 1

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1108	G	-2.412182E-03	-1.575433E-04	2.502435E-01	-1.974827E-02	2.916547E-01	0.0
1109	G	-2.163542E-03	-2.842752E-04	2.240564E-01	-3.734510E-02	2.615415E-01	0.0
1110	G	-1.762452E-03	-3.789965E-04	1.835129E-01	-5.215244E-02	2.138602E-01	0.0
1111	G	-1.256203E-03	-4.751804E-04	1.300596E-01	-6.500601E-02	1.522142E-01	0.0
1112	G	-4.976475E-04	-3.962207E-04	6.757370E-02	-7.251255E-02	8.043959E-02	0.0
1113	G	0.0	-4.615827E-04	0.0	-7.550766E-02	9.010062E-03	0.0
1201	G	1.544414E-03	0.0	0.0	1.823977E-03	-6.306773E-03	0.0
1202	G	-6.734108E-04	0.0	0.0	-3.905736E-03	8.130197E-02	0.0
1203	G	-1.278229E-03	0.0	0.0	2.760014E-03	1.576502E-01	0.0
1204	G	-1.875189E-03	0.0	0.0	2.590239E-03	2.229902E-01	0.0
1205	G	-2.266159E-03	0.0	0.0	1.670984E-03	2.717870E-01	0.0
1206	G	-2.553524E-03	0.0	0.0	9.005028E-04	3.039175E-01	0.0
1207	G	-2.627382E-03	0.0	0.0	-4.094730E-06	3.139830E-01	0.0
1208	G	-2.554942E-03	0.0	0.0	-9.084657E-04	3.038940E-01	0.0
1209	G	-2.268629E-03	0.0	0.0	-1.677653E-03	2.717462E-01	0.0
1210	G	-1.878050E-03	0.0	0.0	-2.595488E-03	2.229428E-01	0.0
1211	G	-1.280638E-03	0.0	0.0	-2.763351E-03	1.576072E-01	0.0
1212	G	-6.746473E-04	0.0	0.0	-3.908489E-03	8.127122E-02	0.0
1213	G	1.545658E-03	0.0	0.0	-1.824623E-03	-6.311444E-03	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 34
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1
EIGENVALUE = 4.744975E+06
CYCLES = 3.466866E+02 R E A L E I G E N V E C T O R N O . 2

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	2.130840E-03	0.0	0.0	-1.986016E-03	-9.182069E-03	0.0
2	G	-2.352184E-03	0.0	0.0	-4.809996E-03	1.620593E-01	0.0
3	G	-3.998665E-03	0.0	0.0	-1.738879E-03	2.798461E-01	0.0
4	G	-4.803731E-03	0.0	0.0	-1.962128E-04	3.270014E-01	0.0
5	G	-4.051016E-03	0.0	0.0	2.029509E-03	2.786835E-01	0.0
6	G	-2.448916E-03	0.0	0.0	4.333658E-03	1.642092E-01	0.0
7	G	-2.579351E-05	0.0	0.0	3.656513E-03	4.428950E-04	0.0
8	G	2.395902E-03	0.0	0.0	4.327328E-03	-1.633080E-01	0.0
9	G	3.993638E-03	0.0	0.0	2.028851E-03	-2.777565E-01	0.0
10	G	4.737766E-03	0.0	0.0	-2.179697E-04	-3.260019E-01	0.0
11	G	3.916942E-03	0.0	0.0	-1.726901E-03	-2.787754E-01	0.0
12	G	2.259143E-03	0.0	0.0	-4.869874E-03	-1.609234E-01	0.0
13	G	-2.250997E-03	0.0	0.0	-1.981782E-03	9.820370E-03	0.0
101	G	0.0	-2.093363E-03	0.0	-1.569498E-01	1.235214E-02	0.0
102	G	-2.025108E-03	-1.684506E-03	-1.347403E-01	-1.339229E-01	1.580126E-01	0.0
103	G	-3.913741E-03	-1.101588E-03	-2.326561E-01	-7.885392E-02	2.714643E-01	0.0
104	G	-4.419210E-03	1.001023E-04	-2.684843E-01	2.630267E-03	3.084709E-01	0.0
105	G	-3.831623E-03	1.157176E-03	-2.302743E-01	7.814368E-02	2.664750E-01	0.0
106	G	-2.209272E-03	1.875662E-03	-1.342481E-01	1.313043E-01	1.533880E-01	0.0
107	G	-2.526158E-05	2.271581E-03	-3.424826E-04	1.576518E-01	3.630832E-04	0.0
108	G	2.157717E-03	1.881660E-03	1.335573E-01	1.313000E-01	-1.526642E-01	0.0
109	G	3.776016E-03	1.169211E-03	2.295691E-01	7.810222E-02	-2.657431E-01	0.0
110	G	4.356131E-03	1.223970E-04	2.677538E-01	2.638620E-03	-3.077503E-01	0.0
111	G	3.843066E-03	-1.065582E-03	2.319551E-01	-7.880739E-02	-2.708719E-01	0.0
112	G	1.946026E-03	-1.621925E-03	1.342052E-01	-1.335532E-01	-1.578268E-01	0.0
113	G	0.0	-2.024246E-03	0.0	-1.561773E-01	-1.284674E-02	0.0
201	G	0.0	-4.399859E-03	0.0	-3.008021E-01	-6.631382E-04	0.0
202	G	-1.926766E-03	-3.675139E-03	-2.601271E-01	-2.568991E-01	1.428765E-01	0.0
203	G	-3.434346E-03	-2.095054E-03	-4.492059E-01	-1.502613E-01	2.426325E-01	0.0
204	G	-4.197095E-03	1.618434E-04	-5.182521E-01	4.346069E-03	2.850434E-01	0.0
205	G	-3.541025E-03	2.252110E-03	-4.448160E-01	1.502021E-01	2.427016E-01	0.0
206	G	-2.118711E-03	3.645372E-03	-2.587569E-01	2.516457E-01	1.426367E-01	0.0
207	G	-2.424537E-05	4.513786E-03	-5.682765E-04	3.014671E-01	1.712439E-04	0.0
208	G	2.068853E-03	3.655033E-03	2.576156E-01	2.516345E-01	-1.422917E-01	0.0
209	G	3.487014E-03	2.272038E-03	4.436593E-01	1.501782E-01	-2.423580E-01	0.0
210	G	4.136551E-03	1.950203E-04	5.170932E-01	4.385511E-03	-2.847295E-01	0.0
211	G	3.366282E-03	-2.044600E-03	4.481805E-01	-1.499929E-01	-2.424126E-01	0.0
212	G	1.866223E-03	-3.616409E-03	2.594893E-01	-2.563007E-01	-1.427812E-01	0.0
213	G	0.0	-4.339884E-03	0.0	-3.000239E-01	8.430985E-04	0.0
301	G	0.0	-6.395256E-03	0.0	-4.277933E-01	4.692744E-03	0.0
302	G	-1.466376E-03	-5.145756E-03	-3.665716E-01	-3.566867E-01	1.090852E-01	0.0
303	G	-2.557548E-03	-3.171949E-03	-6.314595E-01	-2.142993E-01	1.881395E-01	0.0
304	G	-3.044444E-03	1.126470E-04	-7.324524E-01	2.525436E-03	2.189452E-01	0.0
305	G	-2.725900E-03	3.222400E-03	-6.291737E-01	2.136112E-01	1.920029E-01	0.0
306	G	-1.571927E-03	5.114648E-03	-3.663169E-01	3.538132E-01	1.100948E-01	0.0
307	G	-2.263456E-05	6.457943E-03	-6.067489E-04	4.284562E-01	-8.302063E-05	0.0
308	G	1.525306E-03	5.124935E-03	3.650940E-01	3.537942E-01	-1.102539E-01	0.0
309	G	2.675582E-03	3.242778E-03	6.279317E-01	2.135844E-01	-1.921507E-01	0.0
310	G	2.989178E-03	1.440141E-04	7.312184E-01	2.596479E-03	-2.190900E-01	0.0
311	G	2.500477E-03	-3.132647E-03	6.303872E-01	-2.140123E-01	-1.882674E-01	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE — JANUARY 10, 1983 — NASTRAN 12/14/81 — PAGE 35
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** — SUBCASE 1
EIGENVALUE = 4.744975E+06
CYCLES = 3.466866E+02 — R E A L E I G E N V E C T O R N O . 2

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
312	G	1.425624E-03	-5.103750E-03	3.658973E-01	-3.560897E-01	-1.091424E-01	0.0
313	G	0.0	-6.351034E-03	0.0	-4.269567E-01	-4.805157E-03	0.0
401	G	0.0	-7.666197E-03	0.0	-5.172210E-01	1.154294E-03	0.0
402	G	-1.137936E-03	-6.286163E-03	-4.450922E-01	-4.352880E-01	8.115322E-02	0.0
403	G	-1.950189E-03	-3.832269E-03	-7.676220E-01	-2.591011E-01	1.377536E-01	0.0
404	G	-2.311122E-03	3.898180E-05	-8.904293E-01	5.746351E-04	1.607057E-01	0.0
405	G	-1.984082E-03	3.860271E-03	-7.672371E-01	2.585800E-01	1.380508E-01	0.0
406	G	-1.161663E-03	6.304801E-03	-4.452726E-01	4.349199E-01	7.974191E-02	0.0
407	G	-2.086486E-05	7.609734E-03	-4.347521E-04	5.167464E-01	-3.198568E-04	0.0
408	G	1.119207E-03	6.313211E-03	4.443896E-01	4.348842E-01	-8.037592E-02	0.0
409	G	1.939231E-03	3.876319E-03	7.663168E-01	2.585372E-01	-1.386484E-01	0.0
410	G	2.264908E-03	6.146931E-05	8.895030E-01	6.218431E-04	-1.612598E-01	0.0
411	G	1.908697E-03	-3.805917E-03	7.668262E-01	-2.588571E-01	-1.382318E-01	0.0
412	G	1.113006E-03	-6.259070E-03	4.446158E-01	-4.348377E-01	-8.150262E-02	0.0
413	G	0.0	-7.639140E-03	0.0	-5.166645E-01	-1.126912E-03	0.0
501	G	0.0	-8.695260E-03	0.0	-5.815924E-01	1.157383E-03	0.0
502	G	-7.259781E-04	-7.094418E-03	-4.999626E-01	-4.881727E-01	4.689971E-02	0.0
503	G	-1.311403E-03	-4.330258E-03	-8.616988E-01	-2.905598E-01	8.272664E-02	0.0
504	G	-1.458896E-03	1.319172E-05	-9.995982E-01	2.202775E-04	9.278020E-02	0.0
505	G	-1.326579E-03	4.354892E-03	-8.613984E-01	2.907116E-01	8.250083E-02	0.0
506	G	-7.419860E-04	7.099294E-03	-4.996880E-01	4.879809E-01	4.655238E-02	0.0
507	G	-1.955734E-05	8.689248E-03	-1.017418E-04	5.809334E-01	-4.671503E-04	0.0
508	G	7.023050E-04	7.104611E-03	4.994577E-01	4.879146E-01	-4.746139E-02	0.0
509	G	1.286282E-03	4.364540E-03	8.610901E-01	2.906113E-01	-8.335027E-02	0.0
510	G	1.419586E-03	2.598258E-05	9.992151E-01	1.729259E-04	-9.351543E-02	0.0
511	G	1.277512E-03	-4.316119E-03	8.613273E-01	-2.904820E-01	-8.327149E-02	0.0
512	G	7.046860E-04	-7.080754E-03	4.997211E-01	-4.879682E-01	-4.715813E-02	0.0
513	G	0.0	-8.680905E-03	0.0	-5.812963E-01	-1.201269E-03	0.0
601	G	0.0	-8.914072E-03	0.0	-5.988529E-01	-5.361873E-06	0.0
602	G	-2.879364E-06	-7.558430E-03	-5.188626E-01	-5.118276E-01	-1.007919E-04	0.0
603	G	-5.723381E-06	-4.442209E-03	-8.962125E-01	-2.990819E-01	-1.952551E-04	0.0
604	G	-8.668864E-06	1.053974E-05	-1.037212E+00	3.886617E-04	-2.878088E-04	0.0
605	G	-1.202586E-05	4.408585E-03	-8.957977E-01	2.991460E-01	-3.662065E-04	0.0
606	G	-1.533858E-05	7.523493E-03	-5.184660E-01	5.115760E-01	-4.424088E-04	0.0
607	G	-1.898135E-05	8.913954E-03	3.075179E-04	5.988857E-01	-4.979303E-04	0.0
608	G	-2.232211E-05	7.525628E-03	5.190360E-01	5.114662E-01	-5.358586E-04	0.0
609	G	-2.491831E-05	4.412452E-03	8.962326E-01	2.989701E-01	-5.344552E-04	0.0
610	G	-2.475670E-05	-1.508950E-05	1.037478E+00	-2.060289E-04	-5.012186E-04	0.0
611	G	-2.071029E-05	-4.437563E-03	8.963315E-01	-2.992064E-01	-4.028817E-04	0.0
612	G	-1.154914E-05	-7.554780E-03	5.188949E-01	-5.118928E-01	-2.635887E-04	0.0
613	G	0.0	-8.909719E-03	0.0	-5.988723E-01	-1.472327E-06	0.0
701	G	0.0	-8.693444E-03	0.0	-5.814218E-01	-1.169070E-03	0.0
702	G	7.198036E-04	-7.092934E-03	-4.998079E-01	-4.880113E-01	-4.706920E-02	0.0
703	G	1.299092E-03	-4.328955E-03	-8.613941E-01	-2.903972E-01	-8.305670E-02	0.0
704	G	1.440180E-03	1.352326E-05	-9.991503E-01	3.625029E-04	-9.326137E-02	0.0
705	G	1.301170E-03	4.354229E-03	-8.608243E-01	2.908446E-01	-8.312276E-02	0.0
706	G	7.095789E-04	7.097055E-03	-4.989955E-01	4.880981E-01	-4.730090E-02	0.0
707	G	-1.996101E-05	8.684571E-03	6.833193E-04	5.810176E-01	-3.883126E-04	0.0
708	G	-7.491082E-04	7.096615E-03	5.002983E-01	4.879442E-01	4.655272E-02	0.0
709	G	-1.338541E-03	4.353590E-03	8.619328E-01	2.905894E-01	8.243527E-02	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 36
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1
EIGENVALUE = 4.744975E+06
CYCLES = 3.466866E+02 R E A L E I G E N V E C T O R N O . 2

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
710	G	-1,472864E-03	1,233444E-05	1,000000E+00	5,963522E-05	9,267247E-02	0,0
711	G	-1,324104E-03	-4,331457E-03	8,619465E-01	-2,907229E-01	8,262251E-02	0,0
712	G	-7,343651E-04	-7,095969E-03	5,000726E-01	-4,883081E-01	4,685632E-02	0,0
713	G	0,0	-8,696808E-03	0,0	-5,817068E-01	1,143722E-03	0,0
801	G	0,0	-7,663200E-03	0,0	-5,169307E-01	-1,162457E-03	0,0
802	G	1,130993E-03	-6,283522E-03	-4,448259E-01	-4,350064E-01	-8,125456E-02	0,0
803	G	1,936390E-03	-3,830107E-03	-7,670963E-01	-2,588237E-01	-1,379493E-01	0,0
804	G	2,290429E-03	-3,959905E-05	-8,896577E-01	-8,227410E-04	-1,609935E-01	0,0
805	G	1,956162E-03	3,859059E-03	-7,662456E-01	2,588089E-01	-1,384181E-01	0,0
806	G	1,126502E-03	6,300943E-03	-4,440762E-01	4,351264E-01	-8,018715E-02	0,0
807	G	-2,192772E-05	7,601353E-03	9,253383E-04	5,168929E-01	-1,843932E-04	0,0
808	G	-1,169125E-03	6,298760E-03	4,458477E-01	4,349421E-01	7,982283E-02	0,0
809	G	-1,995504E-03	3,855713E-03	7,677874E-01	2,585077E-01	1,380780E-01	0,0
810	G	-2,323675E-03	3,487933E-05	8,908833E-01	4,410157E-04	1,606898E-01	0,0
811	G	-1,960865E-03	-3,836709E-03	7,679320E-01	-2,592708E-01	1,377147E-01	0,0
812	G	-1,143818E-03	-6,290817E-03	4,452449E-01	-4,354580E-01	8,110621E-02	0,0
813	G	0,0	-7,671085E-03	0,0	-5,173907E-01	1,155671E-03	0,0
901	G	0,0	-6,391642E-03	0,0	-4,274532E-01	-4,699944E-03	0,0
902	G	1,458266E-03	-5,142693E-03	-3,662619E-01	-3,563618E-01	-1,090892E-01	0,0
903	G	2,541504E-03	-3,169280E-03	-6,308484E-01	-2,139739E-01	-1,881440E-01	0,0
904	G	3,020490E-03	1,132654E-04	-7,315557E-01	2,808398E-03	-2,189475E-01	0,0
905	G	2,694076E-03	3,221075E-03	-6,280241E-01	2,138799E-01	-1,920040E-01	0,0
906	G	1,532308E-03	5,109987E-03	-3,649280E-01	3,540495E-01	-1,100972E-01	0,0
907	G	-2,469464E-05	6,448089E-03	9,724854E-04	4,286350E-01	7,632233E-05	0,0
908	G	-1,580194E-03	5,107280E-03	3,667981E-01	3,538714E-01	1,102387E-01	0,0
909	G	-2,737583E-03	3,216608E-03	6,296652E-01	2,135782E-01	1,921173E-01	0,0
910	G	-3,056738E-03	1,073277E-04	7,328812E-01	2,423418E-03	2,190232E-01	0,0
911	G	-2,567876E-03	-3,177655E-03	6,317658E-01	-2,144551E-01	1,881857E-01	0,0
912	G	-1,472572E-03	-5,151527E-03	3,667277E-01	-3,568548E-01	1,091149E-01	0,0
913	G	0,0	-6,401238E-03	0,0	-4,279695E-01	4,684327E-03	0,0
1001	G	0,0	-4,396748E-03	0,0	-3,005117E-01	6,619688E-04	0,0
1002	G	1,917281E-03	-3,672277E-03	-2,598590E-01	-2,566134E-01	-1,427782E-01	0,0
1003	G	3,415901E-03	-2,092858E-03	-4,486763E-01	-1,499844E-01	-2,424386E-01	0,0
1004	G	4,169785E-03	1,623861E-04	-5,174784E-01	4,591055E-03	-2,847559E-01	0,0
1005	G	3,505302E-03	2,250865E-03	-4,438233E-01	1,504326E-01	-2,423347E-01	0,0
1006	G	2,074711E-03	3,641314E-03	-2,575568E-01	2,518556E-01	-1,421942E-01	0,0
1007	G	-2,750676E-05	4,504900E-03	8,012798E-04	3,016240E-01	3,262242E-04	0,0
1008	G	-2,128110E-03	3,638867E-03	2,590967E-01	2,517109E-01	1,428260E-01	0,0
1009	G	-3,553407E-03	2,246937E-03	4,451807E-01	1,501924E-01	2,428863E-01	0,0
1010	G	-4,209732E-03	1,571075E-04	5,185806E-01	4,278434E-03	2,852014E-01	0,0
1011	G	-3,444523E-03	-2,100065E-03	4,494477E-01	-1,503764E-01	2,427398E-01	0,0
1012	G	-1,932461E-03	-3,680292E-03	2,602527E-01	-2,570335E-01	1,429222E-01	0,0
1013	G	0,0	-4,405104E-03	0,0	-3,009435E-01	-6,599426E-04	0,0
1101	G	0,0	-2,091321E-03	0,0	-1,567793E-01	-1,235875E-02	0,0
1102	G	2,014776E-03	-1,682714E-03	-1,345849E-01	-1,337601E-01	-1,578457E-01	0,0
1103	G	3,893730E-03	-1,100155E-03	-2,323493E-01	-7,869048E-02	-2,711311E-01	0,0
1104	G	4,389922E-03	1,003555E-04	-2,680355E-01	2,768917E-03	-3,079879E-01	0,0
1105	G	3,793447E-03	1,156562E-03	-2,296991E-01	7,828200E-02	-2,658523E-01	0,0
1106	G	2,162630E-03	1,873127E-03	-1,335516E-01	1,314212E-01	-1,526367E-01	0,0
1107	G	-2,946322E-05	2,266493E-03	4,525522E-04	1,577543E-01	5,000902E-04	0,0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 37
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1
EIGENVALUE = 4.744975E+06
CYCLES = 3.466866E+02 R E A L E I G E N V E C T O R N O . 2

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1108	G	-2.219308E-03	1.871740E-03	1.344233E-01	1.313422E-01	1.535905E-01	0.0
1109	G	-3.844431E-03	1.154220E-03	2.304682E-01	7.814661E-02	2.666963E-01	0.0
1110	G	-4.431964E-03	9.728572E-05	2.686623E-01	2.595464E-03	3.086705E-01	0.0
1111	G	-3.924018E-03	-1.104516E-03	2.327887E-01	-7.891393E-02	2.716144E-01	0.0
1112	G	-2.031267E-03	-1.687783E-03	1.348098E-01	-1.339964E-01	1.580942E-01	0.0
1113	G	0.0	-2.096628E-03	0.0	-1.570274E-01	1.233766E-02	0.0
1201	G	-2.132237E-03	0.0	0.0	-1.986524E-03	9.189445E-03	0.0
1202	G	2.341526E-03	0.0	0.0	-4.810618E-03	-1.618592E-01	0.0
1203	G	3.977880E-03	0.0	0.0	-1.740162E-03	-2.794553E-01	0.0
1204	G	4.773166E-03	0.0	0.0	-1.953743E-04	-3.264258E-01	0.0
1205	G	4.011462E-03	0.0	0.0	2.029295E-03	-2.779490E-01	0.0
1206	G	2.400578E-03	0.0	0.0	4.337087E-03	-1.633176E-01	0.0
1207	G	-3.031846E-05	0.0	0.0	3.657620E-03	5.691596E-04	0.0
1208	G	-2.459417E-03	0.0	0.0	4.337730E-03	1.644226E-01	0.0
1209	G	-4.064130E-03	0.0	0.0	2.030458E-03	2.789216E-01	0.0
1210	G	-4.816756E-03	0.0	0.0	-1.935380E-04	3.272233E-01	0.0
1211	G	-4.009019E-03	0.0	0.0	-1.736746E-03	2.800101E-01	0.0
1212	G	-2.357874E-03	0.0	0.0	-4.806053E-03	1.621429E-01	0.0
1213	G	2.128233E-03	0.0	0.0	-1.984927E-03	-9.168145E-03	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983   NASTRAN 12/14/81   PAGE 38
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3,5 ****   SUBCASE 1
EIGENVALUE = 5,747225E+06
CYCLES = 3,815480E+02   R E A L   E I G E N V E C T O R   N O .   3

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	-1,936327E-03	0,0	0,0	1,619652E-03	8,276011E-03	0,0
2	G	2,657704E-03	0,0	0,0	4,948117E-03	-1,702761E-01	0,0
3	G	5,104460E-03	0,0	0,0	2,678088E-03	-3,299869E-01	0,0
4	G	7,392616E-03	0,0	0,0	3,387300E-03	-4,698796E-01	0,0
5	G	8,808900E-03	0,0	0,0	1,805028E-03	-5,661574E-01	0,0
6	G	1,005769E-02	0,0	0,0	9,847232E-04	-6,403571E-01	0,0
7	G	1,029617E-02	0,0	0,0	1,211788E-05	-6,590515E-01	0,0
8	G	1,003972E-02	0,0	0,0	-9,687497E-04	-6,407270E-01	0,0
9	G	8,771678E-03	0,0	0,0	-1,786847E-03	-5,667547E-01	0,0
10	G	7,336631E-03	0,0	0,0	-3,403607E-03	-4,704893E-01	0,0
11	G	5,027082E-03	0,0	0,0	-2,674352E-03	-3,302937E-01	0,0
12	G	2,571146E-03	0,0	0,0	-5,033808E-03	-1,700396E-01	0,0
13	G	-2,062364E-03	0,0	0,0	-1,627386E-03	8,942684E-03	0,0
101	G	0,0	2,082451E-03	0,0	1,494107E-01	-1,093240E-02	0,0
102	G	2,055119E-03	1,883440E-03	1,344998E-01	1,414374E-01	-1,478641E-01	0,0
103	G	4,356684E-03	1,960927E-03	2,597508E-01	1,310077E-01	-2,829439E-01	0,0
104	G	5,998271E-03	1,354917E-03	3,659130E-01	9,691817E-02	-3,927212E-01	0,0
105	G	7,308909E-03	1,115843E-03	4,431931E-01	7,439552E-02	-4,788941E-01	0,0
106	G	8,228130E-03	7,201599E-04	4,996250E-01	4,396049E-02	-5,375035E-01	0,0
107	G	8,752826E-03	6,828331E-06	5,187084E-01	1,781890E-04	-5,643590E-01	0,0
108	G	8,209298E-03	-7,062959E-04	4,999308E-01	-4,364804E-02	-5,378555E-01	0,0
109	G	7,270840E-03	-1,102413E-03	4,437018E-01	-7,426366E-02	-4,794981E-01	0,0
110	G	5,940920E-03	-1,337555E-03	3,664604E-01	-9,695922E-02	-3,934011E-01	0,0
111	G	4,285227E-03	-1,936477E-03	2,601353E-01	-1,313207E-01	-2,835302E-01	0,0
112	G	1,973052E-03	-1,836145E-03	1,346068E-01	-1,416849E-01	-1,482914E-01	0,0
113	G	0,0	-2,031175E-03	0,0	-1,494087E-01	-1,148152E-02	0,0
201	G	0,0	3,835516E-03	0,0	2,542591E-01	1,733374E-03	0,0
202	G	1,201252E-03	3,648145E-03	2,321720E-01	2,447996E-01	-8,604143E-02	0,0
203	G	2,465248E-03	3,270124E-03	4,484864E-01	2,212610E-01	-1,644251E-01	0,0
204	G	3,679952E-03	2,401701E-03	6,305494E-01	1,679252E-01	-2,353473E-01	0,0
205	G	4,394254E-03	1,888279E-03	7,649150E-01	1,256046E-01	-2,836545E-01	0,0
206	G	4,999581E-03	1,297527E-03	8,612833E-01	7,734753E-02	-3,200615E-01	0,0
207	G	5,114261E-03	1,337432E-05	8,963328E-01	3,492592E-04	-3,293795E-01	0,0
208	G	4,979964E-03	-1,272372E-03	8,618779E-01	-7,676988E-02	-3,203925E-01	0,0
209	G	4,353891E-03	-1,864602E-03	7,659263E-01	-1,252812E-01	-2,842338E-01	0,0
210	G	3,619872E-03	-2,377554E-03	6,316984E-01	-1,679601E-01	-2,360777E-01	0,0
211	G	2,390016E-03	-3,240974E-03	4,494323E-01	-2,216438E-01	-1,651422E-01	0,0
212	G	1,135999E-03	-3,617830E-03	2,326829E-01	-2,453329E-01	-8,658943E-02	0,0
213	G	0,0	-3,806296E-03	0,0	-2,548143E-01	1,912636E-03	0,0
301	G	0,0	4,636679E-03	0,0	2,980764E-01	-1,585598E-03	0,0
302	G	-9,559852E-05	4,160382E-03	2,680988E-01	2,769445E-01	-2,451377E-03	0,0
303	G	-1,902432E-04	4,051777E-03	5,170479E-01	2,603583E-01	4,620949E-03	0,0
304	G	-1,154169E-04	2,821720E-03	7,312879E-01	1,948374E-01	2,283002E-03	0,0
305	G	-5,207913E-05	2,239455E-03	8,868345E-01	1,467684E-01	2,755098E-04	0,0
306	G	-4,485042E-05	1,449514E-03	9,991662E-01	8,699495E-02	6,171050E-05	0,0
307	G	-4,952956E-05	1,874237E-05	1,037277E+00	4,889961E-04	1,359183E-04	0,0
308	G	-6,615334E-05	-1,415559E-03	1,000000E+00	-8,618937E-02	-1,633557E-04	0,0
309	G	-9,548809E-05	-2,210649E-03	8,882716E-01	-1,462716E-01	-1,361557E-04	0,0
310	G	-1,811616E-04	-2,801182E-03	7,329743E-01	-1,948181E-01	1,772264E-03	0,0
311	G	-2,706024E-04	-4,040743E-03	5,185098E-01	-2,608453E-01	-4,149861E-03	0,0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 39
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1
EIGENVALUE = 5,747225E+06
CYCLES = 3,815480E+02 R E A L E I G E N V E C T O R N O . 3

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
312	G	-1,584374E-04	-4,156842E-03	2,689529E-01	-2,777726E-01	2,213407E-03	0,0
313	G	0,0	-4,637623E-03	0,0	-2,990848E-01	-1,719934E-03	0,0
401	G	0,0	3,915063E-03	0,0	2,537811E-01	2,288447E-03	0,0
402	G	-1,363750E-03	3,617511E-03	2,299949E-01	2,395460E-01	8,600746E-02	0,0
403	G	-2,626796E-03	3,430001E-03	4,439392E-01	2,215115E-01	1,652613E-01	0,0
404	G	-3,760504E-03	2,548114E-03	6,285012E-01	1,716217E-01	2,351959E-01	0,0
405	G	-4,476089E-03	1,903416E-03	7,647305E-01	1,255219E-01	2,834287E-01	0,0
406	G	-5,095436E-03	1,309296E-03	8,611539E-01	7,730774E-02	3,202319E-01	0,0
407	G	-5,165415E-03	2,275044E-05	8,963567E-01	5,612969E-04	3,290269E-01	0,0
408	G	-5,116955E-03	-1,267726E-03	8,621246E-01	-7,635371E-02	3,201290E-01	0,0
409	G	-4,519442E-03	-1,870868E-03	7,664223E-01	-1,249241E-01	2,832387E-01	0,0
410	G	-3,824442E-03	-2,531654E-03	6,305145E-01	-1,715496E-01	2,349369E-01	0,0
411	G	-2,702783E-03	-3,434337E-03	4,457394E-01	-2,220425E-01	1,649454E-01	0,0
412	G	-1,423472E-03	-3,636384E-03	2,310755E-01	-2,405961E-01	8,569197E-02	0,0
413	G	0,0	-3,939437E-03	0,0	-2,550744E-01	2,299425E-03	0,0
501	G	0,0	2,364152E-03	0,0	1,493626E-01	3,234920E-03	0,0
502	G	-2,200457E-03	2,067430E-03	1,336039E-01	1,369362E-01	1,445616E-01	0,0
503	G	-4,297153E-03	2,044914E-03	2,572120E-01	1,300723E-01	2,781376E-01	0,0
504	G	-6,023410E-03	1,467293E-03	3,649756E-01	9,846260E-02	3,908295E-01	0,0
505	G	-7,391218E-03	1,123748E-03	4,430623E-01	7,306217E-02	4,791862E-01	0,0
506	G	-8,316098E-03	7,410883E-04	4,993731E-01	4,409411E-02	5,375922E-01	0,0
507	G	-8,812188E-03	2,687189E-05	5,189113E-01	5,875876E-04	5,641143E-01	0,0
508	G	-8,337134E-03	-6,923607E-04	5,003778E-01	-4,312136E-02	5,376247E-01	0,0
509	G	-7,433044E-03	-1,083806E-03	4,448103E-01	-7,243081E-02	4,792597E-01	0,0
510	G	-6,084846E-03	-1,444860E-03	3,670589E-01	-9,839921E-02	3,909597E-01	0,0
511	G	-4,372614E-03	-2,043541E-03	2,591088E-01	-1,305228E-01	2,782824E-01	0,0
512	G	-2,272602E-03	-2,089186E-03	1,348208E-01	-1,380135E-01	1,446251E-01	0,0
513	G	0,0	-2,397651E-03	0,0	-1,509162E-01	3,181360E-03	0,0
601	G	0,0	5,325157E-06	0,0	-5,135997E-04	3,136469E-03	0,0
602	G	-2,654274E-03	7,026545E-06	-4,400734E-04	-4,266582E-04	1,730011E-01	0,0
603	G	-5,215365E-03	1,106470E-05	-7,400107E-04	-2,171678E-04	3,303802E-01	0,0
604	G	-7,497553E-03	1,680440E-05	-8,115701E-04	6,762141E-05	4,712363E-01	0,0
605	G	-8,867677E-03	2,263730E-05	-6,219948E-04	3,352450E-04	5,668455E-01	0,0
606	G	-1,013368E-02	2,708894E-05	-2,332521E-04	4,991754E-04	6,402163E-01	0,0
607	G	-1,038507E-02	2,957279E-05	2,478191E-04	5,304561E-04	6,591853E-01	0,0
608	G	-1,015496E-02	2,887104E-05	6,816131E-04	3,981180E-04	6,403908E-01	0,0
609	G	-8,909557E-03	2,586005E-05	9,467875E-04	1,742170E-04	5,671910E-01	0,0
610	G	-7,559440E-03	2,086595E-05	9,872389E-04	-8,869864E-05	4,717681E-01	0,0
611	G	-5,294735E-03	1,523210E-05	7,969669E-04	-3,131507E-04	3,310869E-01	0,0
612	G	-2,743273E-03	1,103535E-05	4,428643E-04	-4,474428E-04	1,737420E-01	0,0
613	G	0,0	9,083686E-06	0,0	-5,026573E-04	3,063991E-03	0,0
701	G	0,0	-2,354007E-03	0,0	-1,503609E-01	3,230632E-03	0,0
702	G	-2,199625E-03	-2,053432E-03	-1,344517E-01	-1,377482E-01	1,444806E-01	0,0
703	G	-4,295697E-03	-2,023560E-03	-2,586338E-01	-1,304954E-01	2,779986E-01	0,0
704	G	-6,022123E-03	-1,434833E-03	-3,665410E-01	-9,833627E-02	3,906863E-01	0,0
705	G	-7,390405E-03	-1,079697E-03	-4,442611E-01	-7,241256E-02	4,790779E-01	0,0
706	G	-8,316101E-03	-6,888467E-04	-4,998283E-01	-4,314539E-02	5,375629E-01	0,0
707	G	-8,812603E-03	3,087743E-05	-5,184452E-01	4,350244E-04	5,641838E-01	0,0
708	G	-8,337087E-03	7,486885E-04	-4,990851E-01	4,386665E-02	5,377948E-01	0,0
709	G	-7,431336E-03	1,135510E-03	-4,430233E-01	7,275694E-02	4,795099E-01	0,0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983   NASTRAN 12/14/81   PAGE 40
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****   SUBCASE 1
EIGENVALUE = 5.747225E+06
CYCLES = 3.815480E+02   R E A L   E I G E N V E C T O R   N O .   3

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
710	G	-6.080251E-03	1.487594E-03	-3.651990E-01	9.822408E-02	3.912298E-01	0.0
711	G	-4.366187E-03	2.075535E-03	-2.576223E-01	1.299134E-01	2.785163E-01	0.0
712	G	-2.267317E-03	2.113528E-03	-1.340032E-01	1.371859E-01	1.447442E-01	0.0
713	G	0.0	2.418227E-03	0.0	1.499902E-01	3.202273E-03	0.0
801	G	0.0	-3.905633E-03	0.0	-2.546686E-01	2.284918E-03	0.0
802	G	-1.362728E-03	-3.604700E-03	-2.307493E-01	-2.402698E-01	8.587023E-02	0.0
803	G	-2.625196E-03	-3.410657E-03	-4.452060E-01	-2.218905E-01	1.650374E-01	0.0
804	G	-3.758963E-03	-2.518835E-03	-6.298986E-01	-1.715130E-01	2.349511E-01	0.0
805	G	-4.475503E-03	-1.863751E-03	-7.658064E-01	-1.249508E-01	2.832503E-01	0.0
806	G	-5.095987E-03	-1.261958E-03	-8.615750E-01	-7.647078E-02	3.201842E-01	0.0
807	G	-5.166429E-03	2.981336E-05	-8.959700E-01	-3.295778E-04	3.291441E-01	0.0
808	G	-5.116656E-03	1.320352E-03	-8.610253E-01	7.698703E-02	3.204082E-01	0.0
809	G	-4.515177E-03	1.921535E-03	-7.649123E-01	1.251835E-01	2.836370E-01	0.0
810	G	-3.814461E-03	2.576695E-03	-6.289662E-01	1.713695E-01	2.353959E-01	0.0
811	G	-2.689223E-03	3.471592E-03	-4.445293E-01	2.215182E-01	1.653800E-01	0.0
812	G	-1.413690E-03	3.667570E-03	-2.304211E-01	2.399300E-01	8.600632E-02	0.0
813	G	0.0	3.966799E-03	0.0	2.543373E-01	2.272153E-03	0.0
901	G	0.0	-4.629146E-03	0.0	-2.988134E-01	-1.602435E-03	0.0
902	G	-9.447169E-05	-4.149823E-03	-2.687223E-01	-2.775398E-01	2.268246E-03	0.0
903	G	-1.884741E-04	-4.035851E-03	-5.180944E-01	-2.606750E-01	4.316454E-03	0.0
904	G	-1.136994E-04	-2.797414E-03	-7.324448E-01	-1.947485E-01	1.948184E-03	0.0
905	G	-5.142957E-05	-2.206587E-03	-8.877284E-01	-1.463042E-01	1.793287E-05	0.0
906	G	-4.590629E-05	-1.410278E-03	-9.995343E-01	-8.632648E-02	-2.080743E-05	0.0
907	G	-5.138133E-05	2.596080E-05	-1.036996E+00	2.288588E-04	2.689708E-04	0.0
908	G	-6.618695E-05	1.461337E-03	-9.991563E-01	8.667601E-02	1.657626E-04	0.0
909	G	-8.996728E-05	2.257413E-03	-8.871284E-01	1.464382E-01	-3.315218E-04	0.0
910	G	-1.658262E-04	2.848042E-03	-7.318399E-01	1.946341E-01	2.283581E-03	0.0
911	G	-2.449165E-04	4.084558E-03	-5.176853E-01	2.603876E-01	4.591122E-03	0.0
912	G	-1.358888E-04	4.197657E-03	-2.685602E-01	2.773220E-01	2.462503E-03	0.0
913	G	0.0	4.676867E-03	0.0	2.986934E-01	-1.617232E-03	0.0
1001	G	0.0	-3.829665E-03	0.0	-2.547777E-01	1.737513E-03	0.0
1002	G	1.202624E-03	-3.640466E-03	-2.326158E-01	-2.452320E-01	-8.628543E-02	0.0
1003	G	2.468033E-03	-3.258292E-03	-4.492342E-01	-2.214849E-01	-1.648265E-01	0.0
1004	G	3.682969E-03	-2.384127E-03	-6.313725E-01	-1.678599E-01	-2.357966E-01	0.0
1005	G	4.395319E-03	-1.864827E-03	-7.655546E-01	-1.252842E-01	-2.839957E-01	0.0
1006	G	4.998347E-03	-1.269243E-03	-8.615574E-01	-7.688227E-02	-3.201979E-01	0.0
1007	G	5.111432E-03	1.914075E-05	-8.961601E-01	1.397652E-04	-3.292572E-01	0.0
1008	G	4.978274E-03	1.306936E-03	-8.613259E-01	7.709205E-02	-3.200361E-01	0.0
1009	G	4.358414E-03	1.902100E-03	-7.651891E-01	1.253624E-01	-2.837448E-01	0.0
1010	G	3.635612E-03	2.419890E-03	-6.310061E-01	1.677858E-01	-2.355475E-01	0.0
1011	G	2.422697E-03	3.291562E-03	-4.489765E-01	2.213342E-01	-1.646972E-01	0.0
1012	G	1.175317E-03	3.671312E-03	-2.324920E-01	2.451007E-01	-8.631741E-02	0.0
1013	G	0.0	3.858844E-03	0.0	2.546499E-01	1.749514E-03	0.0
1101	G	0.0	-2.078540E-03	0.0	-1.496834E-01	-1.098039E-02	0.0
1102	G	2.056314E-03	-1.878435E-03	-1.347298E-01	-1.416647E-01	-1.481391E-01	0.0
1103	G	4.360123E-03	-1.954726E-03	-2.601388E-01	-1.311296E-01	-2.833977E-01	0.0
1104	G	6.001158E-03	-1.345628E-03	-3.663409E-01	-9.688536E-02	-3.932107E-01	0.0
1105	G	7.309834E-03	-1.103648E-03	-4.435270E-01	-7.423608E-02	-4.792776E-01	0.0
1106	G	8.226332E-03	-7.052257E-04	-4.997730E-01	-4.372036E-02	-5.376668E-01	0.0
1107	G	8.749249E-03	1.011641E-05	-5.186296E-01	6.102216E-05	-5.642585E-01	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE - JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 41
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3,5 **** SUBCASE 1
EIGENVALUE = 5,747225E+06
CYCLES = 3,815480E+02 R E A L E I G E N V E C T O R N O . 3

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1108	G	8,206944E-03	7,252604E-04	-4,996640E-01	4,381177E-02	-5,375348E-01	0,0
1109	G	7,274552E-03	1,123132E-03	-4,433556E-01	7,426332E-02	-4,790644E-01	0,0
1110	G	5,957393E-03	1,363937E-03	-3,661691E-01	9,684710E-02	-3,929947E-01	0,0
1111	G	4,318374E-03	1,971065E-03	-2,600167E-01	1,310545E-01	-2,832148E-01	0,0
1112	G	2,028023E-03	1,892762E-03	-1,346732E-01	1,415989E-01	-1,479820E-01	0,0
1113	G	0,0	2,092407E-03	0,0	1,496300E-01	-1,101243E-02	0,0
1201	G	-1,945121E-03	0,0	0,0	-1,625959E-03	8,315499E-03	0,0
1202	G	2,659780E-03	0,0	0,0	-4,966196E-03	-1,705479E-01	0,0
1203	G	5,107766E-03	0,0	0,0	-2,688142E-03	-3,304520E-01	0,0
1204	G	7,396034E-03	0,0	0,0	-3,396599E-03	-4,704018E-01	0,0
1205	G	8,809962E-03	0,0	0,0	-1,809684E-03	-5,665630E-01	0,0
1206	G	1,005601E-02	0,0	0,0	-9,882446E-04	-6,405422E-01	0,0
1207	G	1,029234E-02	0,0	0,0	-1,511487E-05	-6,589632E-01	0,0
1208	G	1,003672E-02	0,0	0,0	9,601947E-04	-6,404134E-01	0,0
1209	G	8,775443E-03	0,0	0,0	1,783009E-03	-5,663644E-01	0,0
1210	G	7,353876E-03	0,0	0,0	3,376571E-03	-4,702025E-01	0,0
1211	G	5,069514E-03	0,0	0,0	2,678680E-03	-3,303330E-01	0,0
1212	G	2,637925E-03	0,0	0,0	4,967164E-03	-1,705532E-01	0,0
1213	G	-1,950129E-03	0,0	0,0	1,626639E-03	8,353164E-03	0,0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983   NASTRAN 12/14/81   PAGE 42
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3,5 ****   SUBCASE 1
EIGENVALUE = 1,127080E+07
CYCLES = 5,343151E+02   R E A L   E I G E N V E C T O R   N O .   4

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	-2,834466E-03	0,0	0,0	1,489354E-03	1,297498E-02	0,0
2	G	5,906931E-03	0,0	0,0	6,335769E-03	-3,191920E-01	0,0
3	G	1,002632E-02	0,0	0,0	1,402963E-03	-5,481904E-01	0,0
4	G	1,209466E-02	0,0	0,0	4,482898E-04	-6,470572E-01	0,0
5	G	1,005056E-02	0,0	0,0	-1,921396E-03	-5,426038E-01	0,0
6	G	6,252610E-03	0,0	0,0	-6,619589E-03	-3,262313E-01	0,0
7	G	1,001477E-04	0,0	0,0	-2,175355E-03	-2,501273E-04	0,0
8	G	-6,051708E-03	0,0	0,0	-6,612689E-03	3,257034E-01	0,0
9	G	-9,848787E-03	0,0	0,0	-1,921221E-03	5,420063E-01	0,0
10	G	-1,189424E-02	0,0	0,0	4,873508E-04	6,463026E-01	0,0
11	G	-9,829882E-03	0,0	0,0	1,408351E-03	5,472549E-01	0,0
12	G	-5,736283E-03	0,0	0,0	6,461797E-03	3,180317E-01	0,0
13	G	3,021285E-03	0,0	0,0	1,501675E-03	-1,396335E-02	0,0
101	G	0,0	5,081450E-03	0,0	2,930551E-01	-1,584127E-02	0,0
102	G	4,668352E-03	4,094215E-03	2,516558E-01	2,461720E-01	-2,736924E-01	0,0
103	G	8,723326E-03	2,697003E-03	4,348879E-01	1,497869E-01	-4,754042E-01	0,0
104	G	9,616229E-03	-3,801140E-04	5,007428E-01	-1,303879E-02	-5,294471E-01	0,0
105	G	8,228012E-03	-2,667443E-03	4,234478E-01	-1,456774E-01	-4,526062E-01	0,0
106	G	4,757696E-03	-4,106328E-03	2,496112E-01	-2,345205E-01	-2,596338E-01	0,0
107	G	9,875913E-05	-5,222910E-03	1,802746E-04	-2,979835E-01	-1,722188E-04	0,0
108	G	-4,559738E-03	-4,108380E-03	-2,492357E-01	-2,344967E-01	2,592819E-01	0,0
109	G	-8,028856E-03	-2,672440E-03	-4,230264E-01	-1,455812E-01	4,522136E-01	0,0
110	G	-9,418143E-03	-3,956508E-04	-5,002370E-01	-1,297375E-02	5,290076E-01	0,0
111	G	-8,537792E-03	2,663894E-03	-4,343294E-01	1,498640E-01	4,749998E-01	0,0
112	G	-4,505882E-03	4,023326E-03	-2,511622E-01	2,459053E-01	2,735964E-01	0,0
113	G	0,0	5,002286E-03	0,0	2,922945E-01	1,665372E-02	0,0
201	G	0,0	9,078044E-03	0,0	4,995723E-01	3,234618E-03	0,0
202	G	2,852602E-03	7,704031E-03	4,350175E-01	4,291433E-01	-1,633485E-01	0,0
203	G	4,933601E-03	4,391590E-03	7,521361E-01	2,507178E-01	-2,735902E-01	0,0
204	G	6,132226E-03	-6,566732E-04	8,613957E-01	-2,263884E-02	-3,264584E-01	0,0
205	G	5,097935E-03	-4,600296E-03	7,297506E-01	-2,496735E-01	-2,732711E-01	0,0
206	G	3,108958E-03	-7,204474E-03	4,271568E-01	-4,051628E-01	-1,630566E-01	0,0
207	G	9,569114E-05	-9,338490E-03	2,548052E-04	-5,038008E-01	-6,631289E-06	0,0
208	G	-2,916257E-03	-7,206122E-03	-4,266261E-01	-4,051124E-01	1,630328E-01	0,0
209	G	-4,902069E-03	-4,605406E-03	-7,291521E-01	-2,495714E-01	2,732299E-01	0,0
210	G	-5,935804E-03	-6,721190E-04	-8,607113E-01	-2,257129E-02	3,264478E-01	0,0
211	G	-4,748381E-03	4,356338E-03	-7,514700E-01	2,506036E-01	2,737054E-01	0,0
212	G	-2,717522E-03	7,658300E-03	-4,345745E-01	4,287550E-01	1,635929E-01	0,0
213	G	0,0	9,030162E-03	0,0	4,990119E-01	-3,495104E-03	0,0
301	G	0,0	1,099300E-02	0,0	5,909931E-01	-2,501202E-03	0,0
302	G	-2,971967E-04	8,530348E-03	5,013313E-01	4,765665E-01	1,103880E-02	0,0
303	G	-6,026541E-04	5,537939E-03	8,607089E-01	2,985413E-01	2,155831E-02	0,0
304	G	-2,712057E-04	-4,117995E-04	1,000000E+00	-1,340283E-02	1,059015E-02	0,0
305	G	3,021051E-05	-5,522156E-03	8,485027E-01	-2,953253E-01	6,733185E-04	0,0
306	G	6,781584E-05	-8,225331E-03	4,989041E-01	-4,630562E-01	7,769089E-04	0,0
307	G	9,153931E-05	-1,121895E-02	1,819273E-04	-5,970593E-01	1,781992E-04	0,0
308	G	1,175236E-04	-8,224216E-03	-4,984994E-01	-4,629657E-01	-4,579640E-04	0,0
309	G	1,601662E-04	-5,520705E-03	-8,480035E-01	-2,952058E-01	-4,088383E-04	0,0
310	G	4,655015E-04	-4,123889E-04	-9,994259E-01	-1,337604E-02	-1,034393E-02	0,0
311	G	7,875255E-04	5,534364E-03	-8,601996E-01	2,983860E-01	-2,134295E-02	0,0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 43
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1
EIGENVALUE = 1.127080E+07
CYCLES = 5.343151E+02 R E A L E I G E N V E C T O R N O . 4

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
312	G	4.238467E-04	8.527370E-03	-5.010274E-01	4.762884E-01	-1.098144E-02	0.0
313	G	0.0	1.098997E-02	0.0	5.906451E-01	2.707997E-03	0.0
401	G	0.0	9.215417E-03	0.0	4.994939E-01	2.846180E-03	0.0
402	G	-2.929353E-03	7.293454E-03	4.262241E-01	4.081313E-01	1.601829E-01	0.0
403	G	-5.015405E-03	4.627405E-03	7.322965E-01	2.513571E-01	2.740494E-01	0.0
404	G	-5.995609E-03	-1.106849E-04	8.528183E-01	-3.065273E-03	3.234704E-01	0.0
405	G	-4.934389E-03	-4.627872E-03	7.259027E-01	-2.494676E-01	2.710347E-01	0.0
406	G	-2.982846E-03	-7.263429E-03	4.263470E-01	-4.062959E-01	1.632099E-01	0.0
407	G	8.765114E-05	-9.067785E-03	-2.350139E-05	-5.004597E-01	3.001861E-04	0.0
408	G	3.159613E-03	-7.259443E-03	-4.263213E-01	-4.061362E-01	-1.626486E-01	0.0
409	G	5.115938E-03	-4.619524E-03	-7.297114E-01	-2.492708E-01	-2.705933E-01	0.0
410	G	6.179914E-03	-9.602454E-05	-8.525131E-01	-3.025466E-03	-3.231167E-01	0.0
411	G	5.188788E-03	4.653570E-03	-7.320407E-01	2.512405E-01	-2.737011E-01	0.0
412	G	3.048722E-03	7.328054E-03	-4.260930E-01	4.080270E-01	-1.598136E-01	0.0
413	G	0.0	9.250813E-03	0.0	4.993749E-01	-2.847993E-03	0.0
501	G	0.0	5.660074E-03	0.0	2.992287E-01	5.207301E-03	0.0
502	G	-4.604374E-03	4.134547E-03	2.501488E-01	2.326493E-01	2.618828E-01	0.0
503	G	-8.102488E-03	2.754014E-03	4.264547E-01	1.491937E-01	4.527090E-01	0.0
504	G	-9.268064E-03	-4.495894E-05	4.994379E-01	-1.108373E-03	5.185252E-01	0.0
505	G	-8.098254E-03	-2.826948E-03	4.250885E-01	-1.496274E-01	4.523926E-01	0.0
506	G	-4.593710E-03	-4.135980E-03	2.491019E-01	-2.319729E-01	2.590889E-01	0.0
507	G	8.522698E-05	-5.616307E-03	-2.874212E-04	-2.980108E-01	3.203777E-04	0.0
508	G	4.765784E-03	-4.131271E-03	-2.495530E-01	-2.316999E-01	-2.585339E-01	0.0
509	G	8.273291E-03	-2.818369E-03	-4.252451E-01	-1.492819E-01	-4.520293E-01	0.0
510	G	9.445054E-03	-3.012185E-05	-4.993410E-01	-9.069564E-04	-5.184205E-01	0.0
511	G	8.272859E-03	2.778586E-03	-4.263410E-01	1.490318E-01	-4.527936E-01	0.0
512	G	4.740596E-03	4.178120E-03	-2.501899E-01	2.325732E-01	-2.619275E-01	0.0
513	G	0.0	5.712783E-03	0.0	2.994449E-01	-5.106105E-03	0.0
601	G	0.0	-1.280199E-05	0.0	3.667640E-04	2.635453E-03	0.0
602	G	-5.764835E-03	-1.515655E-05	2.981456E-04	2.653589E-04	3.260795E-01	0.0
603	G	-1.009370E-02	-2.053337E-05	4.397615E-04	3.783486E-05	5.483937E-01	0.0
604	G	-1.218564E-02	-2.716509E-05	3.562941E-04	-2.186978E-04	6.526853E-01	0.0
605	G	-9.929564E-03	-3.258208E-05	7.426574E-05	-3.790033E-04	5.457365E-01	0.0
606	G	-6.047446E-03	-3.502981E-05	-2.723947E-04	-3.601898E-04	3.260361E-01	0.0
607	G	8.526669E-05	-3.468513E-05	-5.303401E-04	-1.893905E-04	2.509265E-04	0.0
608	G	6.218461E-03	-3.227398E-05	-5.928616E-04	5.405652E-05	-3.256133E-01	0.0
609	G	1.010260E-02	-2.961134E-05	-4.552239E-04	2.338135E-04	-5.455713E-01	0.0
610	G	1.235984E-02	-2.765284E-05	-2.193645E-04	2.637829E-04	-6.528849E-01	0.0
611	G	1.026629E-02	-2.651949E-05	-2.259164E-05	1.524867E-04	-5.490267E-01	0.0
612	G	5.923501E-03	-2.630319E-05	4.548067E-05	-7.607495E-06	-3.269588E-01	0.0
613	G	0.0	-2.616578E-05	0.0	-8.282546E-05	-2.502740E-03	0.0
701	G	0.0	-5.684630E-03	0.0	-2.985118E-01	5.211651E-03	0.0
702	G	-4.604760E-03	-4.164263E-03	-2.495742E-01	-2.321489E-01	2.619389E-01	0.0
703	G	-8.102949E-03	-2.793662E-03	-4.256111E-01	-1.491149E-01	4.527939E-01	0.0
704	G	-9.267329E-03	-7.105766E-06	-4.987408E-01	7.084967E-04	5.185679E-01	0.0
705	G	-8.096147E-03	2.763673E-03	-4.249255E-01	1.488966E-01	4.523606E-01	0.0
706	G	-4.590882E-03	4.068280E-03	-2.495996E-01	2.312960E-01	2.589777E-01	0.0
707	G	8.774097E-05	5.548657E-03	-6.924088E-04	2.976586E-01	1.330615E-04	0.0
708	G	4.766370E-03	4.067947E-03	2.484713E-01	2.318342E-01	-2.587815E-01	0.0
709	G	8.270162E-03	2.759091E-03	4.244578E-01	1.497595E-01	-4.523131E-01	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 44
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1
EIGENVALUE = 1.127080E+07
CYCLES = 5.343151E+02 R E A L E I G E N V E C T O R N O . 4

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
710	G	9.436596E-03	-2.723637E-05	4.990152E-01	1.405109E-03	-5.186751E-01	0.0
711	G	8.261192E-03	-2.833803E-03	4.263881E-01	-1.487432E-01	-4.529795E-01	0.0
712	G	4.731531E-03	-4.232939E-03	2.503444E-01	-2.326372E-01	-2.620087E-01	0.0
713	G	0.0	-5.768350E-03	0.0	-2.996976E-01	-5.134263E-03	0.0
801	G	0.0	-9.237700E-03	0.0	-4.988529E-01	2.849327E-03	0.0
802	G	-2.929329E-03	-7.320375E-03	-4.257102E-01	-4.076834E-01	1.602665E-01	0.0
803	G	-5.014778E-03	-4.662984E-03	-7.315371E-01	-2.512753E-01	2.741602E-01	0.0
804	G	-5.993675E-03	6.419786E-05	-8.521727E-01	2.732731E-03	3.235419E-01	0.0
805	G	-4.930513E-03	4.571184E-03	-7.297097E-01	2.488428E-01	2.709947E-01	0.0
806	G	-2.977629E-03	7.202038E-03	-4.267202E-01	4.057140E-01	1.630295E-01	0.0
807	G	9.209225E-05	9.005975E-03	-7.490412E-04	5.001917E-01	-8.044222E-07	0.0
808	G	3.160042E-03	7.199925E-03	4.255116E-01	4.063226E-01	-1.630326E-01	0.0
809	G	5.108283E-03	4.560094E-03	7.292193E-01	2.497467E-01	-2.709999E-01	0.0
810	G	6.162484E-03	3.453698E-05	8.524681E-01	3.491819E-03	-3.235256E-01	0.0
811	G	5.166053E-03	-4.715980E-03	7.323172E-01	-2.510367E-01	-2.740844E-01	0.0
812	G	3.032587E-03	-7.391363E-03	4.263777E-01	-4.082244E-01	-1.601167E-01	0.0
813	G	0.0	-9.314291E-03	0.0	-4.997749E-01	-2.805664E-03	0.0
901	G	0.0	-1.101087E-02	0.0	-5.904468E-01	-2.483278E-03	0.0
902	G	-2.968307E-04	-8.552276E-03	-5.008941E-01	-4.761855E-01	1.114836E-02	0.0
903	G	-6.013303E-04	-5.567102E-03	-8.600580E-01	-2.984597E-01	2.171061E-02	0.0
904	G	-2.684465E-04	3.735164E-04	-9.994298E-01	1.314235E-02	1.070603E-02	0.0
905	G	3.501819E-05	5.475448E-03	-8.482899E-01	2.948327E-01	6.703146E-04	0.0
906	G	7.433616E-05	8.174685E-03	-4.991272E-01	4.626197E-01	-6.049127E-04	0.0
907	G	9.712212E-05	1.116679E-02	-6.918689E-04	5.968868E-01	-1.357723E-04	0.0
908	G	1.169354E-04	8.171648E-03	4.980053E-01	4.631701E-01	-8.173190E-04	0.0
909	G	1.480736E-04	5.464878E-03	8.478334E-01	2.956824E-01	-7.493965E-04	0.0
910	G	4.376377E-04	3.478541E-04	9.996959E-01	1.381962E-02	-1.064692E-02	0.0
911	G	7.451280E-04	-5.605489E-03	8.607690E-01	-2.982091E-01	-2.158526E-02	0.0
912	G	3.877927E-04	-8.602608E-03	5.015311E-01	-4.766414E-01	-1.109824E-02	0.0
913	G	0.0	-1.106828E-02	0.0	-5.913600E-01	2.570113E-03	0.0
1001	G	0.0	-9.091223E-03	0.0	-4.991834E-01	3.228867E-03	0.0
1002	G	2.852746E-03	-7.719651E-03	-4.346988E-01	-4.288528E-01	-1.631771E-01	0.0
1003	G	4.934017E-03	-4.412685E-03	-7.516523E-01	-2.506511E-01	-2.733473E-01	0.0
1004	G	6.134169E-03	6.291227E-04	-8.609665E-01	2.245606E-02	-3.262457E-01	0.0
1005	G	5.102967E-03	4.567143E-03	-7.295642E-01	2.493464E-01	-2.732076E-01	0.0
1006	G	3.116155E-03	7.168186E-03	-4.272572E-01	4.048808E-01	-1.631744E-01	0.0
1007	G	1.016348E-04	9.300432E-03	-5.296924E-04	5.037155E-01	-2.486124E-04	0.0
1008	G	-2.916703E-03	7.165984E-03	4.263992E-01	4.053009E-01	1.627647E-01	0.0
1009	G	-4.916177E-03	4.559536E-03	7.292001E-01	2.499660E-01	2.730566E-01	0.0
1010	G	-5.969308E-03	6.136031E-04	8.611365E-01	2.296713E-02	3.263826E-01	0.0
1011	G	-4.805438E-03	-4.435150E-03	7.521358E-01	-2.505143E-01	2.736991E-01	0.0
1012	G	-2.780752E-03	-7.748571E-03	4.350988E-01	-4.291889E-01	1.635950E-01	0.0
1013	G	0.0	-9.122220E-03	0.0	-4.997151E-01	-3.259348E-03	0.0
1101	G	0.0	-5.089280E-03	0.0	-2.928482E-01	-1.578871E-02	0.0
1102	G	4.668788E-03	-4.103459E-03	-2.514890E-01	-2.460160E-01	-2.734915E-01	0.0
1103	G	8.723039E-03	-2.708005E-03	-4.346324E-01	-1.497422E-01	-4.751057E-01	0.0
1104	G	9.618286E-03	3.656381E-04	-5.005116E-01	1.294878E-02	-5.291901E-01	0.0
1105	G	8.233166E-03	2.650263E-03	-4.233373E-01	1.455222E-01	-4.524900E-01	0.0
1106	G	4.764980E-03	4.087201E-03	-2.496404E-01	2.343830E-01	-2.596848E-01	0.0
1107	G	1.047034E-04	5.203013E-03	-2.872100E-04	2.979694E-01	-3.262952E-04	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983   NASTRAN 12/14/81   PAGE 45
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****   SUBCASE 1
EIGENVALUE = 1.127080E+07
CYCLES = 5.343151E+02   R E A L E I G E N V E C T O R N O . 4

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1108	G	-4.560970E-03	4.086060E-03	2.491711E-01	2.346039E-01	2.591671E-01	0.0
1109	G	-8.044198E-03	2.646881E-03	4.231303E-01	1.458529E-01	4.522627E-01	0.0
1110	G	-9.455303E-03	3.588548E-04	5.005854E-01	1.321072E-02	5.292787E-01	0.0
1111	G	-8.599051E-03	-2.717263E-03	4.348706E-01	-1.496741E-01	4.753572E-01	0.0
1112	G	-4.593327E-03	-4.111991E-03	2.516913E-01	-2.461935E-01	2.736342E-01	0.0
1113	G	0.0	-5.099708E-03	0.0	-2.931321E-01	1.600180E-02	0.0
1201	G	-2.824639E-03	0.0	0.0	-1.483475E-03	1.292995E-02	0.0
1202	G	5.906441E-03	0.0	0.0	-6.316534E-03	-3.189968E-01	0.0
1203	G	1.002635E-02	0.0	0.0	-1.391216E-03	-5.478852E-01	0.0
1204	G	1.209630E-02	0.0	0.0	-4.352687E-04	-6.467696E-01	0.0
1205	G	1.005560E-02	0.0	0.0	1.931567E-03	-5.424613E-01	0.0
1206	G	6.259830E-03	0.0	0.0	6.633032E-03	-3.262524E-01	0.0
1207	G	1.057887E-04	0.0	0.0	2.187043E-03	-3.536996E-04	0.0
1208	G	-6.053290E-03	0.0	0.0	6.635381E-03	3.256590E-01	0.0
1209	G	-9.865716E-03	0.0	0.0	1.931760E-03	5.421935E-01	0.0
1210	G	-1.193463E-02	0.0	0.0	-4.479816E-04	6.468459E-01	0.0
1211	G	-9.905565E-03	0.0	0.0	-1.418887E-03	5.481829E-01	0.0
1212	G	-5.842636E-03	0.0	0.0	-6.377426E-03	3.193152E-01	0.0
1213	G	2.863032E-03	0.0	0.0	-1.505193E-03	-1.312719E-02	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 87
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1

E L E M E N T   S T R A I N   E N E R G I E S

ELEMENT-TYPE = HEXA * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 4.364667E+02
SUBCASE 1 TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 1.049331E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10003	6.066628E-01	.1390
10004	1.009094E+00	.2312
10005	1.356286E+00	.3107
10006	1.563535E+00	.3582
10007	1.562443E+00	.3580
10008	1.353384E+00	.3101
10009	1.005459E+00	.2304
10010	6.059308E-01	.1388
10103	6.172669E-01	.1414
10104	9.290846E-01	.2129
10105	1.198403E+00	.2746
10106	1.357168E+00	.3109
10107	1.356725E+00	.3108
10108	1.197525E+00	.2744
10109	9.296497E-01	.2130
10110	6.231384E-01	.1428
10201	4.967080E-01	.1138
10202	5.385173E-01	.1234
10203	6.530790E-01	.1496
10204	7.968910E-01	.1826
10205	9.321600E-01	.2136
10206	1.008385E+00	.2310
10207	1.008721E+00	.2311
10208	9.336745E-01	.2139
10209	8.012513E-01	.1836
10210	6.638077E-01	.1521
10211	5.508097E-01	.1262
10212	4.995549E-01	.1145
10301	8.355881E-01	.1914
10302	7.868868E-01	.1803
10303	7.190734E-01	.1647
10304	6.529432E-01	.1496
10305	6.229639E-01	.1427
10306	5.972131E-01	.1368
10307	5.980234E-01	.1370
10308	6.255831E-01	.1433
10309	6.580785E-01	.1508
10310	7.258695E-01	.1663
10311	7.898075E-01	.1810
10312	8.320389E-01	.1906
10401	1.122435E+00	.2572
10402	9.976869E-01	.2286
10403	7.943524E-01	.1820
10404	5.593553E-01	.1282
10409	5.627863E-01	.1289
10410	7.970220E-01	.1826

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 88
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1

E L E M E N T S T R A I N E N E R G I E S

ELEMENT-TYPE = HEXA * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 4.364667E+02
SUBCASE 1 TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 1.049331E+02
*

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10411	9.970987E-01	.2284
10412	1.118367E+00	.2562
10501	1.295345E+00	.2968
10502	1.121675E+00	.2570
10503	8.334930E-01	.1910
10504	4.957093E-01	.1136
10509	4.973521E-01	.1139
10510	8.340980E-01	.1911
10511	1.119877E+00	.2566
10512	1.291394E+00	.2959
10601	1.295396E+00	.2968
10602	1.121723E+00	.2570
10603	8.335309E-01	.1910
10604	4.957131E-01	.1136
10609	4.962080E-01	.1137
10610	8.332325E-01	.1909
10611	1.120292E+00	.2567
10612	1.293054E+00	.2963
10701	1.122565E+00	.2572
10702	9.978152E-01	.2286
10703	7.944635E-01	.1820
10704	5.594040E-01	.1282
10709	5.593195E-01	.1281
10710	7.939540E-01	.1819
10711	9.967791E-01	.2284
10712	1.121096E+00	.2569
10801	8.357419E-01	.1915
10802	7.870507E-01	.1803
10803	7.192447E-01	.1648
10804	6.530910E-01	.1496
10805	6.230116E-01	.1427
10806	5.969251E-01	.1368
10807	5.968955E-01	.1368
10808	6.228531E-01	.1427
10809	6.527489E-01	.1496
10810	7.187049E-01	.1647
10811	7.862517E-01	.1801
10812	8.347477E-01	.1913
10901	4.968276E-01	.1138
10902	5.386660E-01	.1234
10903	6.532893E-01	.1497
10904	7.971867E-01	.1826
10905	9.325386E-01	.2137
10906	1.008723E+00	.2311
10907	1.008620E+00	.2311
10908	9.322137E-01	.2136

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 89
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1

E L E M E N T   S T R A I N   E N E R G I E S

ELEMENT-TYPE = HEXA * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 4.364667E+02
SUBCASE 1 TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 1.049331E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL*
10909	7.967120E-01	.1825
10910	6.527793E-01	.1496
10911	5.381500E-01	.1233
10912	4.962918E-01	.1137
11003	6.175074E-01	.1415
11004	9.295400E-01	.2130
11005	1.199179E+00	.2747
11006	1.358342E+00	.3112
11007	1.358203E+00	.3112
11008	1.198777E+00	.2747
11009	9.290198E-01	.2129
11010	6.170574E-01	.1414
11103	6.069252E-01	.1391
11104	1.009658E+00	.2313
11105	1.357343E+00	.3110
11106	1.565311E+00	.3586
11107	1.565160E+00	.3586
11108	1.356914E+00	.3109
11109	1.009132E+00	.2312
11110	6.065194E-01	.1390
TYPE = HEXA SUBTOTAL	1.049331E+02	24.0415

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983   NASTRAN 12/14/81   PAGE 90
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****   SUBCASE 1

E L E M E N T   S T R A I N   E N E R G I E S

ELEMENT-TYPE = HEXA   * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 2.002277E+03
SUBCASE 2   TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 6.611846E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL *
10002	2.130532E+00	.1064
10003	3.775080E+00	.1885
10004	3.763201E+00	.1879
10005	2.196115E+00	.1097
10008	2.177398E+00	.1087
10009	3.737539E+00	.1867
10010	3.759649E+00	.1878
10011	2.155811E+00	.1077
10101	2.173062E+00	.1085
10102	2.688518E+00	.1343
10103	3.384954E+00	.1691
10104	3.436821E+00	.1716
10105	2.818277E+00	.1408
10106	2.301597E+00	.1149
10107	2.296464E+00	.1147
10108	2.804473E+00	.1401
10109	3.422260E+00	.1709
10110	3.389123E+00	.1693
10111	2.759501E+00	.1378
10112	2.242697E+00	.1120
10201	5.187502E+00	.2591
10202	3.760781E+00	.1878
10203	2.612132E+00	.1305
10204	2.767717E+00	.1382
10205	3.878027E+00	.1937
10206	5.204918E+00	.2599
10207	5.202045E+00	.2598
10208	3.871449E+00	.1934
10209	2.765968E+00	.1381
10210	2.635652E+00	.1316
10211	3.802094E+00	.1899
10212	5.193708E+00	.2594
10301	8.470597E+00	.4230
10302	5.052986E+00	.2524
10305	5.068832E+00	.2532
10306	8.384896E+00	.4188
10307	8.383879E+00	.4187
10308	5.067800E+00	.2531
10311	5.060391E+00	.2527
10312	8.446249E+00	.4218
10401	1.140431E+01	.5696
10402	6.315120E+00	.3154
10405	6.282823E+00	.3138
10406	1.127016E+01	.5629
10407	1.126962E+01	.5628
10408	6.283386E+00	.3138

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE            JANUARY  10, 1983   NASTRAN 12/14/81    PAGE     91
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****                                               SUBCASE 1

                              E L E M E N T   S T R A I N   E N E R G I E S

            ELEMENT-TYPE = HEXA              * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM     =   2.002277E+03
            SUBCASE             2              TOTAL ENERGY OF ALL ELEMENTS IN SET      99 =   6.611846E+02
                                                                                   *
```

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10411	6.213998E+00	.3153
10412	1.138299E+01	.5685
10501	1.331810E+01	.6651
10502	7.100306E+00	.3546
10505	7.001705E+00	.3497
10506	1.317674E+01	.6581
10507	1.317470E+01	.6580
10508	6.998553E+00	.3495
10511	7.099324E+00	.3546
10512	1.330633E+01	.6646
10601	1.331425E+01	.6650
10602	7.098326E+00	.3545
10605	7.006469E+00	.3499
10606	1.318094E+01	.6583
10607	1.317633E+01	.6581
10608	6.996687E+00	.3494
10611	7.102749E+00	.3547
10612	1.331923E+01	.6652
10701	1.139461E+01	.5691
10702	6.309607E+00	.3151
10705	6.293403E+00	.3143
10706	1.128025E+01	.5634
10707	1.127457E+01	.5631
10708	6.281218E+00	.3137
10711	6.318678E+00	.3156
10712	1.140928E+01	.5698
10801	8.459050E+00	.4225
10802	5.045937E+00	.2520
10805	5.078578E+00	.2536
10806	8.395817E+00	.4193
10807	8.391629E+00	.4191
10808	5.069978E+00	.2532
10811	5.056477E+00	.2525
10812	8.475745E+00	.4233
10901	5.178328E+00	.2586
10902	3.753432E+00	.1875
10903	2.607584E+00	.1302
10904	2.766571E+00	.1382
10905	3.880716E+00	.1938
10906	5.211513E+00	.2603
10907	5.211071E+00	.2603
10908	3.880889E+00	.1938
10909	2.769324E+00	.1383
10910	2.614085E+00	.1306
10911	3.763787E+00	.1880
10912	5.191327E+00	.2593

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983   NASTRAN 12/14/81   PAGE 92
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****   SUBCASE 1

E L E M E N T   S T R A I N   E N E R G I E S

ELEMENT-TYPE = HEXA   * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 2,002277E+03
SUBCASE 2   TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 6,611846E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL *
11001	2,168582E+00	,1083
11002	2,682255E+00	,1340
11003	3,376144E+00	,1686
11004	3,427231E+00	,1712
11005	2,811311E+00	,1404
11006	2,301191E+00	,1149
11007	2,305108E+00	,1151
11008	2,821657E+00	,1409
11009	3,440412E+00	,1718
11010	3,388251E+00	,1692
11011	2,690894E+00	,1344
11012	2,174855E+00	,1086
11102	2,124917E+00	,1061
11103	3,763259E+00	,1879
11104	3,747660E+00	,1872
11105	2,182211E+00	,1090
11108	2,199461E+00	,1098
11109	3,767886E+00	,1882
11110	3,779226E+00	,1887
11111	2,132603E+00	,1065
TYPE = HEXA SUBTOTAL	6,611846E+02	33,0216

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 93
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** SUBCASE 1

E L E M E N T   S T R A I N   E N E R G I E S

ELEMENT-TYPE = HEXA * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 2.422684E+03
SUBCASE 3 TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 8.194045E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL *
10002	2.905085E+00	.1199
10003	6.877236E+00	.2839
10004	1.119307E+01	.4620
10005	1.512107E+01	.6241
10006	1.773264E+01	.7319
10007	1.774467E+01	.7324
10008	1.515170E+01	.6254
10009	1.123134E+01	.4636
10010	6.919671E+00	.2856
10011	2.962737E+00	.1223
10102	2.874697E+00	.1187
10103	4.568205E+00	.1886
10104	6.448978E+00	.2662
10105	8.283360E+00	.3419
10106	9.458253E+00	.3904
10107	9.465698E+00	.3907
10108	8.305069E+00	.3428
10109	6.485032E+00	.2677
10110	4.622799E+00	.1908
10111	2.972580E+00	.1227
10201	3.372752E+00	.1392
10202	3.060989E+00	.1263
10203	2.490892E+00	.1028
10210	2.523449E+00	.1042
10211	3.107303E+00	.1283
10212	3.411448E+00	.1408
10301	3.394748E+00	.1401
10302	3.163286E+00	.1306
10303	2.662720E+00	.1099
10310	2.635092E+00	.1088
10311	3.139460E+00	.1296
10312	3.398445E+00	.1403
10402	3.007766E+00	.1242
10403	4.661243E+00	.1924
10404	6.476555E+00	.2673
10405	8.268360E+00	.3413
10406	9.354511E+00	.3861
10407	9.349746E+00	.3859
10408	8.256076E+00	.3408
10409	6.456671E+00	.2665
10410	4.626134E+00	.1910
10411	2.923745E+00	.1207
10502	2.944596E+00	.1215
10503	6.877767E+00	.2839
10504	1.118746E+01	.4618
10505	1.506743E+01	.6219

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE — JANUARY 10, 1983 — NASTRAN 12/14/81 — PAGE 94
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** — SUBCASE 1

E L E M E N T   S T R A I N   E N E R G I E S

ELEMENT-TYPE = HEXA — * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 2.422684E+03
SUBCASE 3 — TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 8.194045E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL *
10506	1.760677E+01	.7267
10507	1.760888E+01	.7268
10508	1.507287E+01	.6222
10509	1.119442E+01	.4621
10510	6.874521E+00	.2838
10511	2.903122E+00	.1198
10602	2.947386E+00	.1217
10603	6.876064E+00	.2838
10604	1.118293E+01	.4616
10605	1.506326E+01	.6218
10606	1.760638E+01	.7267
10607	1.761379E+01	.7270
10608	1.508142E+01	.6225
10609	1.120318E+01	.4624
10610	6.879943E+00	.2840
10611	2.902855E+00	.1198
10702	3.015687E+00	.1245
10703	4.658784E+00	.1923
10704	6.467157E+00	.2669
10705	8.259235E+00	.3409
10706	9.353121E+00	.3861
10707	9.359373E+00	.3863
10708	8.271984E+00	.3414
10709	6.472453E+00	.2672
10710	4.634640E+00	.1913
10711	2.921873E+00	.1206
10801	3.413582E+00	.1409
10802	3.174170E+00	.1310
10803	2.662956E+00	.1099
10810	2.629825E+00	.1086
10811	3.128393E+00	.1291
10812	3.387424E+00	.1398
10901	3.387803E+00	.1398
10902	3.071964E+00	.1268
10903	2.496551E+00	.1030
10910	2.488156E+00	.1027
10911	3.064746E+00	.1265
10912	3.386371E+00	.1398
11002	2.884405E+00	.1191
11003	4.580858E+00	.1891
11004	6.461803E+00	.2667
11005	8.292048E+00	.3423
11006	9.459695E+00	.3905
11007	9.459085E+00	.3904
11008	8.291096E+00	.3422
11009	6.463202E+00	.2668

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE          JANUARY 10, 1983   NASTRAN 12/14/81    PAGE    95
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5   ****                                                 SUBCASE 1

                          E L E M E N T   S T R A I N   E N E R G I E S

         ELEMENT-TYPE = HEXA               * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM      =   2.422684E+03
         SUBCASE             3               TOTAL ENERGY OF ALL ELEMENTS IN SET       99 =   8.194045E+02
                                                                                    *
                        ELEMENT-ID          STRAIN-ENERGY          PERCENT OF TOTAL
                           11010            4.584733E+00               .1892
                           11011            2.888488E+00               .1192
                           11102            2.913985E+00               .1203
                           11103            6.894856E+00               .2846
                           11104            1.121418E+01               .4629
                           11105            1.513746E+01               .6248
                           11106            1.773771E+01               .7322
                           11107            1.773743E+01               .7321
                           11108            1.513779E+01               .6248
                           11109            1.121768E+01               .4630
                           11110            6.901045E+00               .2849
                           11111            2.918783E+00               .1205

            TYPE = HEXA     SUBTOTAL        8.194045E+02              33.8222
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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE   JANUARY 10, 1983   NASTRAN 12/14/81   PAGE 96
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****   SUBCASE 1

E L E M E N T   S T R A I N   E N E R G I E S

ELEMENT-TYPE = HEXA   * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 4.374695E+03
SUBCASE 4   TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 1.464924E+03

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL *
10002	1.138756E+01	.2603
10003	1.979153E+01	.4524
10004	1.935058E+01	.4423
10005	1.113955E+01	.2546
10008	1.112191E+01	.2542
10009	1.932956E+01	.4418
10010	1.980121E+01	.4526
10011	1.149867E+01	.2628
10101	9.382074E+00	.2145
10102	1.007273E+01	.2302
10103	1.092999E+01	.2498
10104	1.100226E+01	.2515
10105	9.708083E+00	.2219
10106	9.293953E+00	.2124
10107	9.291642E+00	.2124
10108	9.703927E+00	.2218
10109	1.101065E+01	.2517
10110	1.098711E+01	.2512
10111	1.029274E+01	.2353
10112	9.592576E+00	.2193
10201	1.616537E+01	.3695
10202	9.022190E+00	.2062
10205	8.758264E+00	.2002
10206	1.585425E+01	.3624
10207	1.585375E+01	.3624
10208	8.759500E+00	.2002
10211	9.093349E+00	.2079
10212	1.620291E+01	.3704
10301	1.600130E+01	.3658
10302	9.278446E+00	.2121
10305	8.808468E+00	.2014
10306	1.568307E+01	.3585
10307	1.567739E+01	.3584
10308	8.796525E+00	.2011
10311	9.160231E+00	.2094
10312	1.591286E+01	.3637
10401	9.536849E+00	.2180
10402	9.779454E+00	.2235
10403	1.059999E+01	.2423
10404	1.062052E+01	.2428
10405	9.778197E+00	.2235
10406	9.352480E+00	.2138
10407	9.340242E+00	.2135
10408	9.751776E+00	.2229
10409	1.058725E+01	.2420
10410	1.052242E+01	.2405

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN   BY  11 IN PLATE            JANUARY  10, 1983   NASTRAN 12/14/81     PAGE    97
SIMPLY SUPPORTED CONFIG, .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5    ****                                                SUBCASE 1

                                  E L E M E N T   S T R A I N   E N E R G I E S

          ELEMENT-TYPE = HEXA                 * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM      =    4.374695E+03
          SUBCASE             4                 TOTAL ENERGY OF ALL ELEMENTS IN SET      99 =    1.464924E+03
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ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL*
10411	9.514448E+00	.2175
10412	9.270612E+00	.2119
10502	1.099734E+01	.2514
10503	1.935705E+01	.4425
10504	1.926917E+01	.4405
10505	1.113922E+01	.2546
10508	1.111543E+01	.2541
10509	1.925339E+01	.4401
10510	1.932782E+01	.4418
10511	1.086024E+01	.2483
10602	1.099547E+01	.2513
10603	1.936014E+01	.4425
10604	1.926671E+01	.4404
10605	1.112934E+01	.2544
10608	1.113006E+01	.2544
10609	1.927149E+01	.4405
10610	1.934135E+01	.4421
10611	1.086811E+01	.2484
10701	9.509786E+00	.2174
10702	9.772915E+00	.2234
10703	1.060547E+01	.2424
10704	1.061464E+01	.2426
10705	9.755086E+00	.2230
10706	9.332477E+00	.2133
10707	9.347938E+00	.2137
10708	9.785525E+00	.2237
10709	1.062544E+01	.2429
10710	1.054828E+01	.2411
10711	9.534130E+00	.2179
10712	9.291117E+00	.2124
10801	1.596849E+01	.3650
10802	9.268153E+00	.2119
10805	8.785117E+00	.2008
10806	1.566437E+01	.3581
10807	1.568879E+01	.3586
10808	8.831247E+00	.2019
10811	9.165576E+00	.2095
10812	1.594680E+01	.3645
10901	1.613824E+01	.3689
10902	9.010183E+00	.2060
10905	8.742912E+00	.1999
10906	1.584437E+01	.3622
10907	1.586413E+01	.3626
10908	8.783034E+00	.2008
10911	9.014322E+00	.2061
10912	1.618122E+01	.3699

MODAL STRAIN ENERGY DISTRIBUTION OF 16 IN BY 11 IN PLATE — JANUARY 10, 1983 — NASTRAN 12/14/81 — PAGE 98
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 **** — SUBCASE 1

E L E M E N T   S T R A I N   E N E R G I E S

ELEMENT-TYPE = HEXA — * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 4.374695E+03
SUBCASE 4 — TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 1.464924E+03

	ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
	11001	9.368119E+00	.2141
	11002	1.005937E+01	.2299
	11003	1.091695E+01	.2495
	11004	1.099035E+01	.2512
	11005	9.699886E+00	.2217
	11006	9.291369E+00	.2124
	11007	9.297385E+00	.2125
	11008	9.717704E+00	.2221
	11009	1.102152E+01	.2519
	11010	1.095349E+01	.2504
	11011	1.009400E+01	.2307
	11012	9.395029E+00	.2148
	11102	1.137365E+01	.2600
	11103	1.977064E+01	.4519
	11104	1.933469E+01	.4420
	11105	1.113412E+01	.2545
	11108	1.113197E+01	.2545
	11109	1.935740E+01	.4425
	11110	1.981435E+01	.4529
	11111	1.140804E+01	.2608
TYPE = HEXA	SUBTOTAL	1.464924E+03	33.4863